



STATE OF WASHINGTON
DEPARTMENT OF COMMUNITY,
TRADE AND ECONOMIC DEVELOPMENT

2005 Washington State Energy Indicators

September 2005

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2005 Washington State Energy Indicators Contents

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Introduction

Energy is a critical component of every aspect of Washington's economy and is used daily by every resident of the state. Energy lights and heats our homes, cooks our food, fuels our vehicles, and powers our industries. We have developed a series of 24 "Energy Indicators" to illustrate some of the most important long-term energy trends in Washington. The links below for each indicator connect to a chart illustrating the trend, a table with the energy data, narrative giving additional perspective or describing further aspects of the indicator, data sources for the indicator, and links to other related information.

This is the most current version of the Energy Indicators, which were first published in 1999 as part of the 1999 Biennial Energy Report. The Indicators began as a successor to the Washington State Energy Use Profile, which was published periodically in the past by the Washington State Energy Office, most recently in June of 1996.

Collecting and publishing detailed statistics on energy consumption, price, and expenditures for fifty states and the District of Columbia is a large task involving analysis and compilation of fuel- and sector-specific data. Thus comprehensive state information from EIA lags by two to three years. Consequently, the Energy Indicators are confined to analysis of long-term energy trends. Data for most of the Energy Indicators runs from 1970 to 2001. A few are one year snapshots. However, we have developed some indicators of more recent energy trends using different energy data sources. Links to more current data are included for those Energy Indicators where this information is available.

In order to ensure that the Energy Indicators presented here are grounded in the best available information and can be updated on a regular basis, they are based as much as possible on regularly published data from sources in the public domain. The U.S. Energy Information Administration (EIA) has the most complete sources of annual, state-level energy data (www.eia.doe.gov). Our principal source is the EIA's Combined State Energy Data System (SEDS). Some other sources include the US Bureau of Economic Analysis (US BEA), the US Census Bureau, the President's Council of Economic Advisors (CEA), the Washington State Office of Financial Management (WA OFM), Federal Highway Administration (FHWA), Oak Ridge National Laboratory Center for Transportation Analysis (ORNL), and the Washington State Fuel Mix Database. The sources are listed with each indicator.

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Methodology

Introduction

Most publicly available comprehensive energy data at the state level originate with surveys and estimates developed by the Energy Information Administration (EIA), an independent branch of the federal Department of Energy. We rely heavily on the EIA's State Energy Data System (SEDS) to produce Energy Indicators and other products. However we modify data from the EIA, based on years of experience with their components to more accurately portray energy use in Washington. This includes the exclusion of non-energy uses of petroleum and the calculation of primary energy use for hydroelectricity generation.

Excluded Petroleum Products

We exclude the consumption of petroleum products for non-energy purposes. This includes asphalt, road oil, and lubricants from the transportation and industrial sectors. These are easily removed series that are clearly not used as energy sources.

We also exclude industrial petroleum coke, used in various forms as a source of pure carbon. The EIA series for industrial coke comprises coke used in oil refining and primary aluminum smelting. Neither of these processes uses coke for its energy content, but rather for its catalytic and conductive properties. These two types of coke are allocated to states, not according to measured use at the state level, but instead based on their share of the United States' annual capacity in the respective industries multiplied against US industrial coke use. The capacity of both these industries has grown considerably in Washington, and their share of the US total has also grown.

Indexed against 1970, the first year in which data pairs showing consumption and expenditure are available in SEDS, the Washington aluminum industry expanded by almost a third by 1997, and represented the largest primary smelting share of any state, at 29% of the nation's total. Recently this share has declined.

While representing a much smaller share of the nation's petroleum refining industry, Washington's oil refineries have seen continued growth, while US capacity has changed little since the mid-80s.

The effect of these growing industries combined with the EIA inclusion of the (non-energy) petroleum coke they use as industrial energy consumption has resulted in distortion of the true patterns of industrial energy consumption, and thus an inflated view of energy use overall in Washington. That effect was magnified in the 1980's and 90's, when at their peak, these non-fuel petroleum products accounted for more than 1/4th of the total Washington industrial energy use claimed by the EIA.

We have also excluded other non-energy consumption such as petroleum used as feedstock for paints and solvents, or to make waxes to coat packaging. The focus of this analysis is energy consumption in Washington, rather than the supply of and demand for petroleum products or other fossil fuels. Excluding these non-energy uses provides the most accurate picture of the consumption of energy in the state.

Hydroelectric Conversion

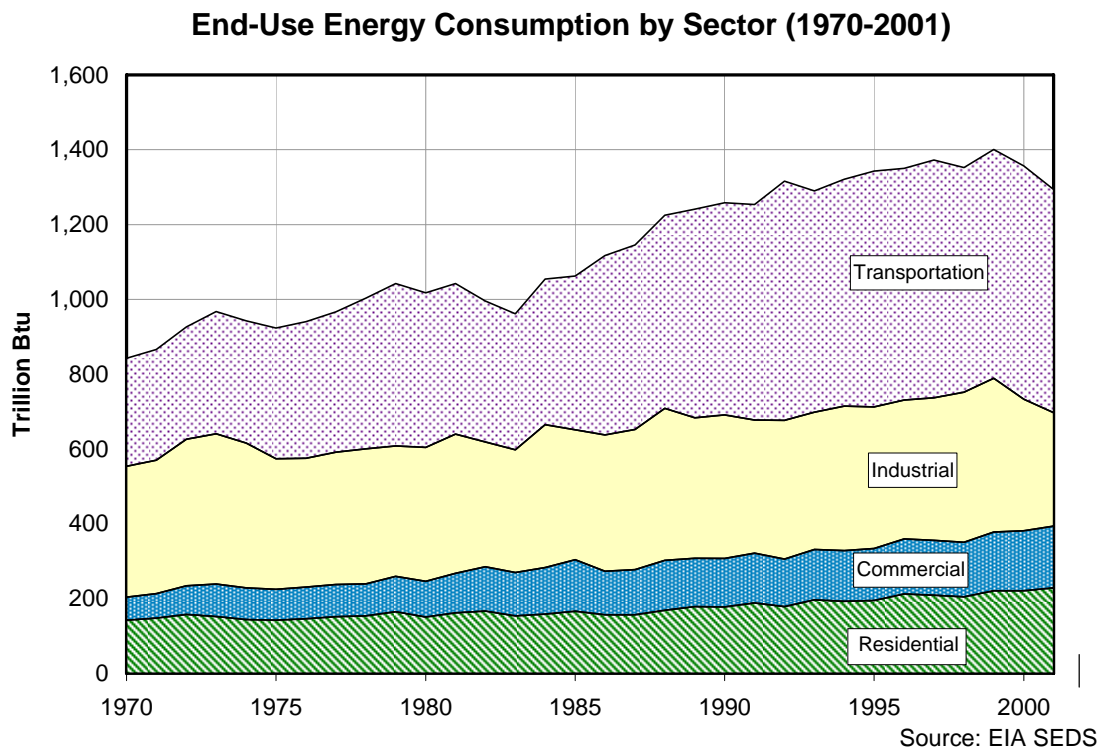
One last methodological note must be made to explain the differences one may notice here compared to other tallies of state primary energy use. In a steam powered generator, as much as two-thirds of the energy in the fuel that is consumed is not converted to electricity, but is lost as waste heat due to thermal inefficiencies. Hydroelectric power generation does not experience thermal losses, but the EIA assigns losses to it equivalent to an average loss rate for fossil fuel powered generation, in an effort to enable comparison of primary energy consumption between individual states. We remove those imputed losses from our primary totals. This difference does not affect depictions of sector end-use consumption of energy, as these do not show primary consumption.

Methodology Summary

In summary, large amounts of non-energy petroleum products used in aluminum smelting and oil refining, and the calculation of primary energy use for hydroelectricity generation require modifications to standard views of energy consumption to portray accurately the trends depicted in these Indicators.

1. Washington's End-Use Energy Consumption by Sector

END USE ENERGY CONSUMPTION IN WASHINGTON WAS 54% HIGHER IN 2001 THAN IN 1970, WHILE POPULATION GREW BY 75 PERCENT DURING THIS PERIOD. MOST OF THE INCREASE IN CONSUMPTION OCCURRED IN THE TRANSPORTATION SECTOR, WHERE ENERGY USE HAS MORE THAN DOUBLED SINCE 1970.



Washington's end-use energy consumption grew at an average rate of 1.4% per year between 1970 and 2001. Consumption reached an all-time high of 1.4 quadrillion Btu in 1999 before declining 8% by 2001 due to a drop in industrial energy consumption.

During the 1970s and early 1980s, growth in energy consumption was dampened by higher energy prices and changes in the state's economy, but has grown fairly steadily since 1983. The transportation sector accounts for the largest share of growth in energy consumption, growing at an annual rate of 3.5% since 1980. Energy consumption in the commercial sector, which includes service industries such as software, finances, and insurance, grew at a 4.8% rate since 1980, but remains small relative to the other sectors. Residential sector energy use grew at a more modest 2.3% during the same period. Industrial sector energy consumption was nearly flat during most of this period and declined 26% from 1999 to 2001. This reflects changes in the state's economy and in recent years the decline of the aluminum industry.

The transportation sector accounted for 46% of the energy use in Washington in 2001. The industrial sector still accounted for 23% of consumption, followed by the residential

sector at 18% and commercial at 13%. The industrial share has declined since 1970, when it accounted for 42% of Washington's energy consumption.

End-Use Energy Consumption By Sector				
Units: Trillion Btu				
Year	Residential	Commercial	Industrial	Transportation
1960	102	37	250	178
1961	102	38	245	182
1962	103	39	259	189
1963	106	40	272	191
1964	115	46	299	198
1965	112	45	312	204
1966	118	49	322	222
1967	117	50	324	246
1968	128	55	344	280
1969	138	58	356	288
1970	142	61	351	289
1971	148	66	357	296
1972	157	76	392	300
1973	152	87	402	327
1974	144	84	387	327
1975	142	83	349	349
1976	146	85	344	365
1977	152	86	353	375
1978	154	86	361	403
1979	165	94	349	434
1980	151	95	358	413
1981	162	105	372	402
1982	167	118	334	377
1983	154	116	328	363
1984	159	124	382	390
1985	166	138	347	411
1986	157	116	364	480
1987	157	121	374	494
1988	169	133	406	517
1989	179	129	376	557
1990	178	130	384	567
1991	188	133	356	576
1992	179	127	371	639
1993	196	135	367	591
1994	193	136	386	607
1995	195	139	378	631
1996	212	147	371	620
1997	209	147	381	636
1998	205	146	401	601
1999	221	157	411	612
2000	221	160	352	624
2001	228	165	303	597

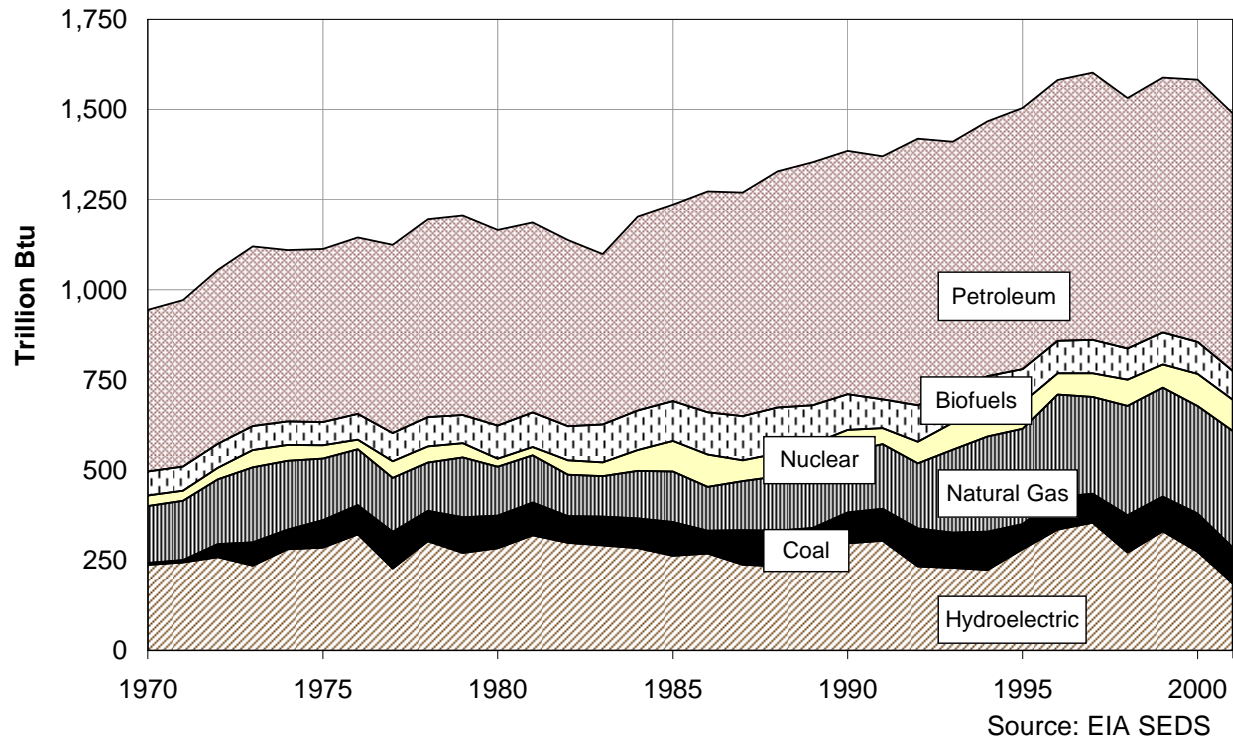
Source: Energy Information Administration's State Energy Data System

Links: No Links to more current information.

2. Washington's Primary Energy Consumption by Source

WASHINGTON CONTINUES TO RELY ON PETROLEUM FUELS FOR ABOUT HALF OF ITS PRIMARY ENERGY USE. THE RELATIVE CONTRIBUTION OF HYDROELECTRICITY AS AN ENERGY SOURCE HAS DECLINED. BECAUSE OF LOW RIVER FLOWS IN 2001, HYDRO PRODUCTION DROPPED TO ITS LOWEST LEVEL IN 35 YEARS.

Total Primary Energy Consumption by Source (1970-2001)



Sources: Energy Information Administration's State Energy Data System

This indicator shows the extent of Washington's reliance on six major primary¹ energy sources: petroleum, hydroelectricity, natural gas, biofuels, coal, and uranium (nuclear)². Washington continues to rely on petroleum, more than three-quarters of which is imported by tanker from Alaska, to meet 48% (in 2001) of its primary energy needs. The petroleum share of primary energy use has not changed appreciably – in 1965 it was 50%. Fossil fuels (petroleum, coal, and natural gas) accounted for 76% of primary energy use in 2001.

¹ The difference between primary and end-use energy consumption is the treatment of electricity (other fuels such as natural gas, petroleum, and coal are primary energy sources). Electricity must be generated using energy sources such as coal, natural gas, or falling water. These inputs to the power plant are counted as primary energy; the output of the power plant that is consumed by homes and businesses is end-use electricity. Since over half of the energy inputs to thermal power plants are typically lost as waste heat, primary energy consumption is larger than end-use. Note that some of the primary energy used to produce electricity in Washington may be for electricity used in other states. Washington typically generates more electricity than is consumed in the state (see Indicator #3).

² Several other renewable energy sources, geothermal, wind, and solar, account for less than 1% of primary energy consumption.

Hydroelectricity has been a key energy source in Washington for many years. It is important to recognize that total generation from hydroelectric dams varies depending on river flows. Generation in 2001 was 32% lower than the average over the last 30 years. This compares to the peak year in 1997 when generation was 29% greater than the average. Hydroelectricity's relative share as a primary energy source in Washington has declined from about a quarter of consumption in the 1970s and early 1980s. During this period consumption of natural gas has more than doubled, regaining the market share it lost during the 1970s. Natural gas accounted for nearly 22% of Washington's primary energy consumption in 2001.

Biofuels, mainly wood and wood waste products, accounted for a little more than 5% of primary energy consumption in 2001. This share has declined some from the 1980s. These fuels are primarily burned for steam and cogeneration at pulp and paper mills. Coal is consumed almost exclusively at the Centralia Steam Plant, while uranium is used at Energy Northwest's Columbia Generating Station in Richland. Together, fuel use at coal and nuclear generation plants accounted for 13% of Washington's primary energy consumption in 2001.

Primary Energy Consumption by Source						
Units:	Trillion Btu					
Year	Bio Fuels	Coal	Hydroelectric	Nuclear	Natural Gas	Petroleum
1960	58.53	15.23	116.53	-	67.21	335.99
1961	57.88	15.71	126.85	-	72.81	326.94
1962	59.08	15.65	134.32	-	84.28	332.97
1963	62.31	13.19	146.48	-	93.43	335.10
1964	65.25	11.83	159.87	-	113.93	353.80
1965	66.25	12.13	167.54	-	116.22	359.62
1966	67.11	11.13	179.50	11.50	124.83	382.25
1967	63.61	8.26	200.33	23.29	135.25	394.07
1968	67.28	6.98	218.85	44.09	148.07	438.73
1969	67.22	7.07	229.92	40.48	153.48	447.53
1970	66.52	5.86	236.76	28.69	158.24	448.26
1971	67.17	6.40	243.72	27.67	165.28	461.31
1972	66.97	36.58	258.34	31.50	179.82	481.84
1973	66.24	64.97	234.94	48.32	207.95	498.04
1974	65.17	54.17	280.85	43.41	191.31	475.63
1975	64.30	76.24	284.99	36.43	171.24	480.67
1976	71.39	81.21	321.72	26.57	154.88	489.66
1977	78.31	102.39	226.80	46.47	149.08	521.92
1978	81.04	84.72	302.85	45.30	133.34	548.93
1979	77.45	99.00	270.83	39.30	165.95	553.81
1980	91.66	90.96	283.13	22.27	135.47	542.94
1981	96.14	90.87	319.27	22.52	131.19	527.37
1982	94.50	74.07	298.81	40.21	114.41	516.29
1983	105.17	80.21	291.50	38.10	111.80	472.54
1984	109.38	82.28	284.22	57.61	131.97	537.61
1985	110.22	93.67	262.46	85.38	139.98	544.18
1986	117.00	63.28	268.97	89.28	121.79	612.72
1987	122.53	95.70	237.81	57.73	136.09	619.47
1988	126.90	99.10	233.31	63.62	150.60	654.76
1989	107.32	96.65	243.29	64.75	167.99	673.83
1990	98.87	85.57	297.50	60.76	167.62	675.30

1991	79.71	89.08	303.94	44.35	179.39	673.78
1992	101.56	106.09	232.38	59.60	180.77	738.97
1993	95.42	97.81	229.00	74.95	229.62	683.83
1994	96.83	106.88	223.00	70.44	263.18	707.07
1995	92.62	69.79	280.53	72.94	264.47	723.89
1996	90.07	90.90	335.27	58.69	283.91	723.07
1997	92.75	80.47	354.42	65.53	268.14	740.80
1998	86.53	103.48	271.52	72.56	303.31	694.67
1999	89.11	96.88	329.91	63.60	302.26	706.71
2000	88.79	106.24	273.51	89.74	297.57	726.67
2001	80.02	99.51	186.55	86.20	323.07	714.43

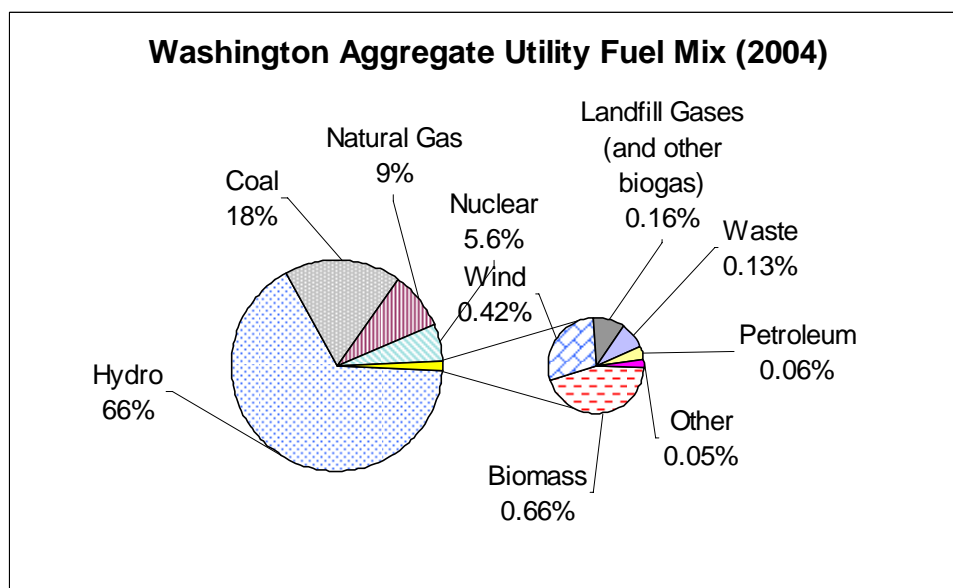
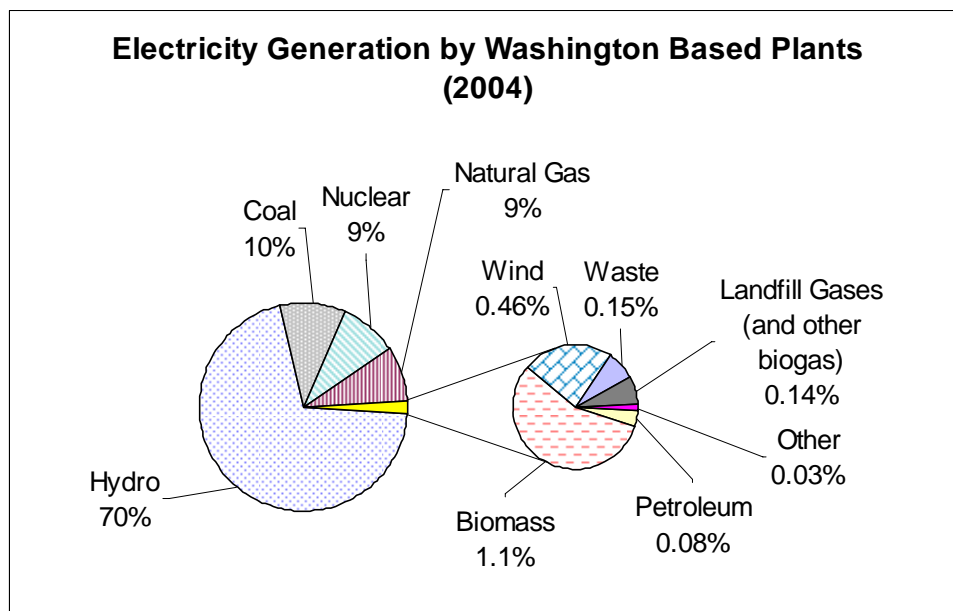
Note: Several other renewable energy sources, geothermal, wind, and solar, account for less than 1% of primary energy consumption.

Links

See Section 4 of the 2003 Biennial Energy Report for more information on electricity generation in Washington (particularly items 1, 2, 3, and 14). Located on the Washington Energy Policy website at: http://www.cted.wa.gov/CTED/documents/ID_1694_Publications.pdf

3. Washington's Electricity Generation and Consumption by Fuel

ABOUT TWO-THIRDS OF THE ELECTRICITY GENERATED AND CONSUMED IN WASHINGTON IN 2004 WAS PRODUCED FROM HYDROELECTRIC DAMS. COAL, NATURAL GAS, AND NUCLEAR ARE THE PRIMARY ENERGY SOURCES FOR THE REMAINDER OF THE ELECTRICITY GENERATED AND CONSUMED IN WASHINGTON ALONG WITH A SMALL AMOUNT OF PETROLEUM AND A FEW NON-HYDRO RENEWABLE SOURCES (LESS THAN 2%).



There are two ways to look at the energy sources for electricity in Washington. One way is to consider the sources for electricity generated in Washington. Electricity generated from hydroelectric dams accounted for 70% of the electricity generated in the state in 2004 while coal, natural gas, and nuclear accounted for most of the remainder. Electricity generated from non-hydro renewable sources such as biomass, wind, waste, and landfill gas accounted for a little less than 2%

of the total generation. In 2004 power plants in Washington generated 24% more electricity than consumed in the state.

Another approach and perhaps better estimate for "Washington's electricity sources" is the mix of generation purchased by utilities to serve customers in Washington State. Washington is part of an interconnected, regional bulk power system and utilities purchase electricity generated from a variety of sources throughout the region. The data for estimating the sources of electricity consumed in Washington is collected for the Washington State Fuel Mix Disclosure Project and includes utility spot market purchases. Hydroelectricity was still the dominant source, accounting for 66% of the electricity consumed in the state in 2004. Electricity generated from coal accounted for 18% of the electricity used by Washington consumers, which is larger than the generation share. This reflects the electricity purchased by some utilities from coal fired power plants located in other states like Wyoming. Renewable sources besides hydro accounted for a little less than one and a half percent of the electricity purchased by utilities for use by Washington consumers.

Note that 37% of the electricity used by Washington consumers from natural gas fired generation in Washington was from cogeneration plants. These applications use both the electricity and heat energy from the power plant. Thus the overall energy efficiency of these plants is higher than an electricity generator alone.

Electricity Generation, by Fuel Type		
Generation by Washington based plants		
Fuel	MWh	Pct
Hydro	71,031,078	70.209%
Coal	10,455,750	10.335%
Petroleum	77,026	0.076%
Nuclear	8,981,583	8.878%
Natural Gas	8,722,141	8.621%
Biomass	1,108,460	1.096%
Wind	466,636	0.461%
Waste	154,331	0.153%
Landfill Gases (and other biogas)	140,902	0.139%
Other	32,754	0.032%
Total	101,170,661	100.000%
Washington aggregate utility fuel mix		
Fuel	MWh	Pct
Hydro	54,132,176	66.199%
Coal	14,459,001	17.682%
Natural Gas	7,379,356	9.024%
Nuclear	4,591,072	5.614%
Biomass	536,643	0.656%
Wind	346,470	0.424%
Landfill Gases (and other biogas)	134,122	0.164%
Waste	102,864	0.126%
Petroleum	53,046	0.065%
Other	37,379	0.046%
Total	81,772,127	100.000%

Source: Washington State Fuel Mix Disclosure Database, Energy Policy Group, Washington State Department of Community Trade and Economic Development

Links

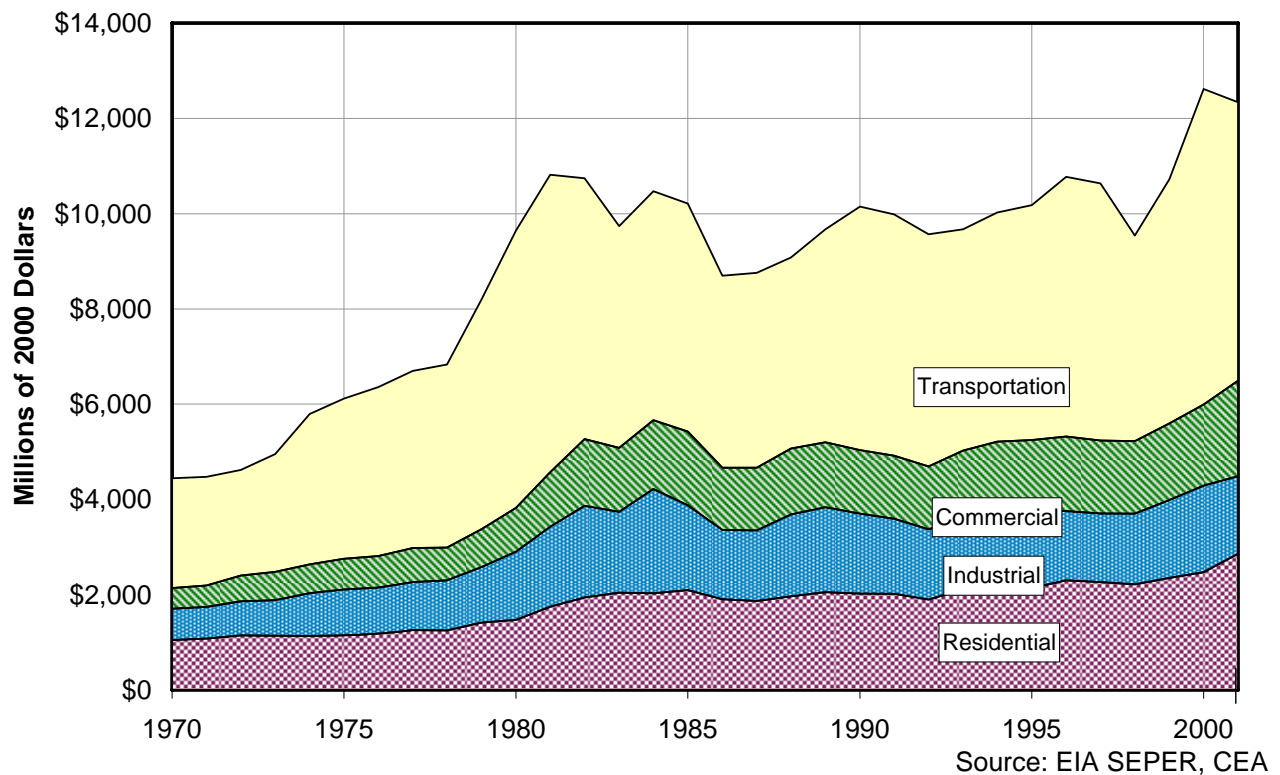
CTED Energy Indicator history page is here:

http://www.cted.wa.gov/portal/alias_cted/lang_en/tabID_822/DesktopDefault.aspx

4. Washington's End Use Energy Expenditures by Sector

ENERGY EXPENDITURES IN WASHINGTON GREW BY MORE THAN 30 PERCENT IN 1999 AND 2000. THIS REVERSED A TREND FROM THE MID-1980S WHEN EXPENDITURES DECLINED OR GREW MODESTLY DESPITE SIGNIFICANT GROWTH IN ENERGY CONSUMPTION.

End-Use Energy Expenditures by Sector (1970-2001)



Sources: Energy Information Administration's State Energy Price and Expenditure Report; President's Council of Economic Advisors - 2005 Annual Economic Report of the President

End Use Energy Expenditures By Sector (millions of 2000 dollars)					
Year	Total Energy Expenditures	Commercial	Industrial	Residential	Transportation
1970	4,445	433	656	1,051	2,305
1971	4,474	451	667	1,076	2,281
1972	4,620	543	717	1,143	2,216
1973	4,953	596	747	1,137	2,473
1974	5,796	601	895	1,141	3,160
1975	6,118	642	965	1,145	3,366
1976	6,360	665	964	1,186	3,546
1977	6,699	716	1,012	1,256	3,716
1978	6,833	691	1,049	1,252	3,841
1979	8,199	800	1,164	1,415	4,820
1980	9,648	919	1,430	1,475	5,825
1981	10,816	1,143	1,679	1,748	6,247
1982	10,744	1,401	1,925	1,942	5,477
1983	9,739	1,343	1,693	2,046	4,657
1984	10,470	1,447	2,186	2,032	4,806
1985	10,211	1,552	1,777	2,099	4,782
1986	8,696	1,311	1,455	1,904	4,027
1987	8,757	1,319	1,480	1,871	4,087
1988	9,079	1,380	1,723	1,966	4,011
1989	9,672	1,363	1,785	2,054	4,470
1990	10,149	1,336	1,677	2,023	5,113
1991	9,986	1,324	1,573	2,021	5,067
1992	9,568	1,318	1,474	1,899	4,877
1993	9,671	1,403	1,511	2,111	4,647
1994	10,022	1,467	1,597	2,151	4,807
1995	10,176	1,497	1,615	2,138	4,926
1996	10,771	1,567	1,452	2,301	5,451
1997	10,638	1,534	1,441	2,265	5,398
1998	9,540	1,521	1,485	2,218	4,316
1999	10,725	1,606	1,634	2,354	5,131
2000	12,617	1,701	1,816	2,476	6,623
2001	12,336	2,008	1,626	2,863	5,840

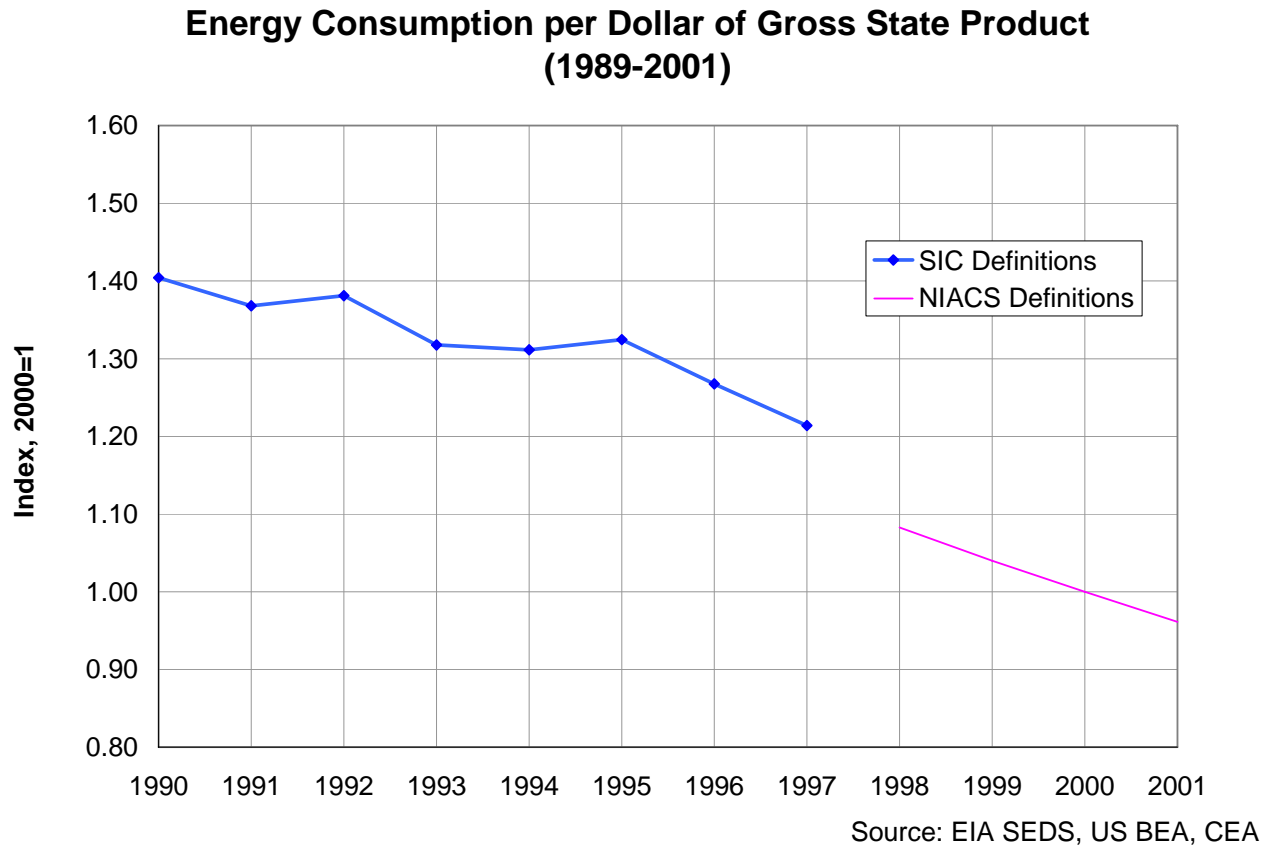
Washingtonians spent \$12.3 billion on energy in 2001. After peaking in the early 1980's, inflation-adjusted expenditures declined and then increased modestly until 1998. During this period energy prices did not keep pace with inflation. This situation changed in 1999 and 2000 when expenditures grew by 32%. Inflation-adjusted expenditures in 2001 were 14% higher than 1980, which is a 1.2% annual growth rate.

The transportation sector accounts for the largest share of energy expenditures, 47% in 2001. This proportion declined, however, from over 60% in 1980, even as transportation's share of statewide energy consumption increased reflecting a decline in the real price of petroleum fuels. The residential and commercial shares of expenditures grew during this period due to growth in consumption.

Links: No Links to more current information.

5. Washington's Energy Consumption per Dollar of Gross State Product

WASHINGTON CONTINUES TO PRODUCE MORE REAL VALUE IN GOODS AND SERVICES PER UNIT OF ENERGY CONSUMED, DESPITE GROWTH IN TOTAL ENERGY CONSUMPTION. KEY REASONS ARE A SHIFT IN THE STATE'S ECONOMY TO HIGH-VALUE BUSINESSES THAT ARE LESS ENERGY-INTENSIVE AND IMPROVED PROCESS EFFICIENCY.



Sources: Energy Information Administration's State Energy Data System;
U.S. Department of Commerce, Bureau of Economic Analysis

Energy Consumption per GSP				
Units:	billion Btu	millions of chained 2000 dollars	1000 Btu/\$2000	2000=1
Year	Total Consumption	Total WA Gross State Product	WA Consumption per dollar of GSP	Index
1990	1,258,276.47	\$ 145,628	8.64	1.40
1991	1,253,516.69	\$ 148,912	8.42	1.37
1992	1,315,892.40	\$ 154,831	8.50	1.38
1993	1,289,754.45	\$ 159,045	8.11	1.32
1994	1,321,631.54	\$ 163,769	8.07	1.31
1995	1,343,169.52	\$ 164,783	8.15	1.32
1996	1,350,488.63	\$ 173,119	7.80	1.27
1997	1,372,570.69	\$ 183,719	7.47	1.21
1998	1,352,305.32	\$ 202,958	6.66	1.08
1999	1,400,830.22	\$ 218,905	6.40	1.04
2000	1,356,691.37	\$ 220,459	6.15	1.00
2001	1,293,742.82	\$ 218,726	5.91	0.96
Note: there was a change in industry definitions from SIC to NAICS classification that results in a discontinuity in the data from 1997 to 1998. Thus data before and after 1998 are not directly comparable.				

This measure of the overall energy intensity of Washington's economy depicts the amount of energy we use to produce a dollar's worth of economic output. Washington energy consumption is divided by real Gross State Product (GSP, the sum of all goods and services produced in the state in constant dollars) and the result is indexed so that the value in 2000 is equal to one. Despite a 27 percent increase in Washington's total energy consumption between 1980 and 2001, energy consumption per dollar of GSP is 40% to 50% less¹.

Washington's economy is growing faster than its energy consumption. This is due to a number of factors, chief among them is growth in the state's economic output and a shift from resource and manufacturing industries to commercial activity based on software, biotech, and other less energy intensive businesses. This trend will likely continue with the decline in production by the energy intensive aluminum industry. Gains in process energy efficiency have also contributed to the reduction in Washington's energy intensity.

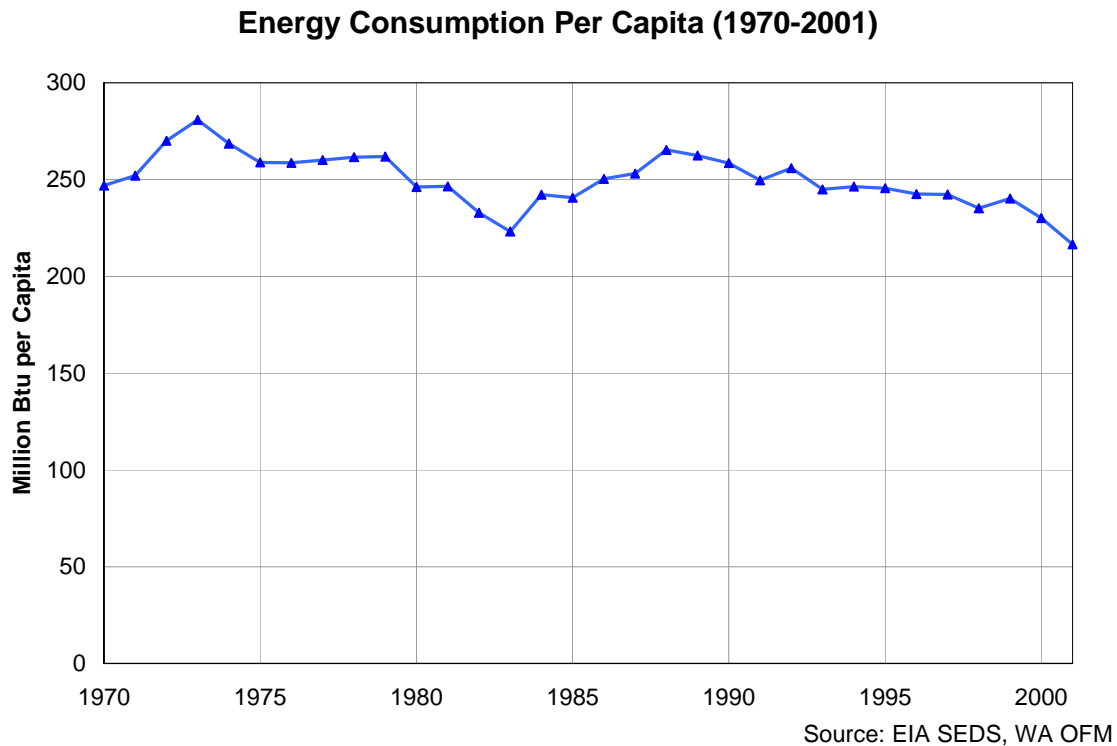
Notes: 1. Because there was a change in definitions for industry classifications used in the definition of gross state product in 1997 (from SIC to NAICS), an exact comparison of energy intensity from 1980 to 2001 is not possible.

Links

No links to more current information

6. Washington's Energy Consumption per Capita

ENERGY CONSUMPTION PER CAPITA IN WASHINGTON HAS BEEN RELATIVELY CONSTANT FOR THE LAST 20 YEARS WITH GROWTH IN ENERGY USE MATCHING GROWTH IN POPULATION. HOWEVER, ENERGY USE DECLINED IN THE EARLY 1970S, 1980S AND IN 2000 AND 2001 (MOSTLY DUE TO ECONOMIC FACTORS), RESULTING IN 10% TO 15% DECLINES IN PER CAPITA ENERGY CONSUMPTION DURING THOSE PERIODS.



Sources: Energy Information Administration's State Energy Data System; Washington State Office of Financial Management

Energy Consumption per Capita			
Units:	billion Btu		million Btu/person
Year	Total Consumption	Population	Consumption per Capita
1970	842,713.11	3,413,250	246.89
1971	865,967.47	3,436,300	252.01
1972	926,290.52	3,430,300	270.03
1973	967,466.60	3,444,300	280.89
1974	942,354.24	3,508,700	268.58
1975	923,420.37	3,567,890	258.81
1976	940,193.19	3,634,891	258.66

1977	966,520.38	3,715,375	260.14
1978	1,003,594.94	3,836,200	261.61
1979	1,042,257.57	3,979,200	261.93
1980	1,017,424.72	4,132,353	246.21
1981	1,042,311.00	4,229,281	246.45
1982	995,867.36	4,276,549	232.87
1983	961,297.46	4,307,248	223.18
1984	1,054,510.54	4,354,070	242.19
1985	1,062,647.74	4,415,785	240.65
1986	1,117,143.49	4,462,211	250.36
1987	1,145,690.64	4,527,101	253.07
1988	1,225,011.94	4,616,886	265.33
1989	1,240,910.78	4,728,076	262.46
1990	1,258,276.47	4,866,663	258.55
1991	1,253,516.69	5,021,335	249.64
1992	1,315,892.40	5,141,177	255.95
1993	1,289,754.45	5,265,688	244.94
1994	1,321,631.54	5,364,338	246.37
1995	1,343,169.52	5,470,104	245.55
1996	1,350,488.63	5,567,764	242.55
1997	1,372,570.69	5,663,763	242.34
1998	1,352,305.32	5,750,033	235.18
1999	1,400,830.22	5,830,835	240.25
2000	1,356,691.37	5,894,143	230.18
2001	1,293,742.82	5,974,910	216.53

Another way to look at Washington's energy intensity is energy consumption per capita. Washington's per capita energy consumption has stayed fairly close to 250 million Btu during the last 20 years, which is the energy equivalent of about 2000 gallons of gasoline per person. This indicates growth in energy use has been similar to growth in population. Energy consumption declined from 1973 to 1975, 1981 to 1983, and 1999 to 2001 largely due to economic downturns during these periods. This led to drops in per capita energy consumption, which reached a low of 216 million Btu per person in 2001. The growth in per capita energy use during the mid-1980s was largely due to increased transportation fuel use as Washingtonians drove more and more miles per year.

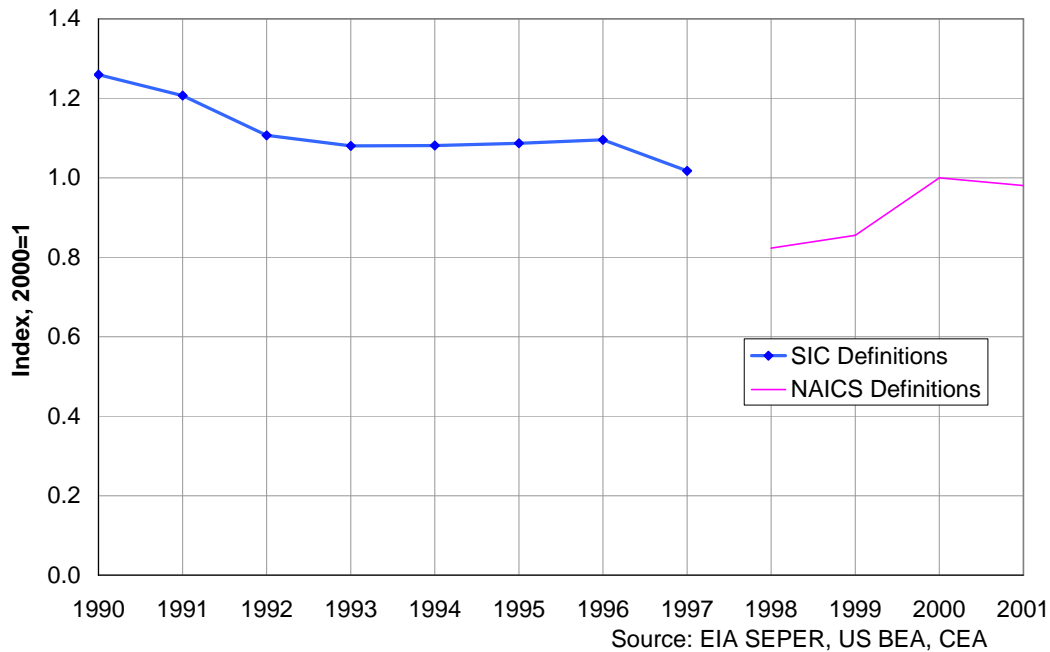
Links

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7. Washington's Energy Expenditures and Gross State Product

ENERGY EXPENDITURES¹ DECLINED RELATIVE TO ECONOMIC OUTPUT, DESPITE GROWTH IN ENERGY CONSUMPTION, FROM THE MID-1980S THROUGH 1997. THIS TREND REVERSED IN 1998 DUE TO RISING ENERGY PRICES, ALTHOUGH A DROP IN ENERGY USE IN 2000 AND 2001 IS MODERATING THE IMPACT OF HIGHER PRICES.

**Energy Expenditures per Dollar of Gross State Product
(1990-2001)**



Sources: Energy Information Administration's State Energy Price and Expenditure Report; U.S. Department of Commerce, Bureau of Economic Analysis

Energy Expenditures per Capita				
Units:	millions of Dollars	millions of chained 2000 dollars	cents/dollar	2000=1
Year	TtlExpnd	Total WA Gross State Product	Energy Expenditures per dollar of WA GSP (SIC Definitions)	Index (SIC Definitions)
1990	8,337.14	\$ 145,628	7.21	1.26
1991	8,471.54	\$ 148,912	6.91	1.21
1992	8,308.11	\$ 154,831	6.33	1.11
1993	8,581.39	\$ 159,045	6.18	1.08
1994	9,078.51	\$ 163,769	6.19	1.08
1995	9,410.65	\$ 164,783	6.22	1.09
1996	10,140.03	\$ 173,119	6.27	1.10
1997	10,153.24	\$ 183,719	5.82	1.02

1998	9,163.66	\$	202,958	4.71	0.82
1999	10,463.33	\$	218,905	4.89	0.86
2000	12,616.71	\$	220,459	5.72	1.00
2001	12,582.33	\$	218,726	5.61	0.98
Note there was a change in industry definitions from SIC to NAICS classification that results in a discontinuity in the data from 1997 to 1998. Thus data before and after 1998 are not directly comparable.					

This indicator divides statewide energy expenditures by economic output, in the form of Gross State Product. The result is an estimate of the significance of energy in Washington's economy. In 2001 approximately 5.6¢ was spent on energy in Washington for every dollar of gross state product. This number has been declining steadily since peaking at more than 10¢ in 1981². Two trends contributed to this decline: Washington's economy was becoming less energy-intensive and real energy prices were declining. However, energy prices began to rise in 1999, increasing Washington's energy expenditures per gross state product from its low of 4.7¢ in 1998. A decline in energy use in 2001 moderated the impact of higher prices on energy expenditures.

Notes:

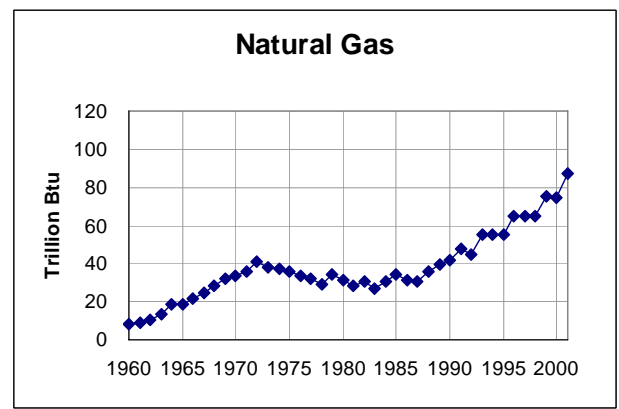
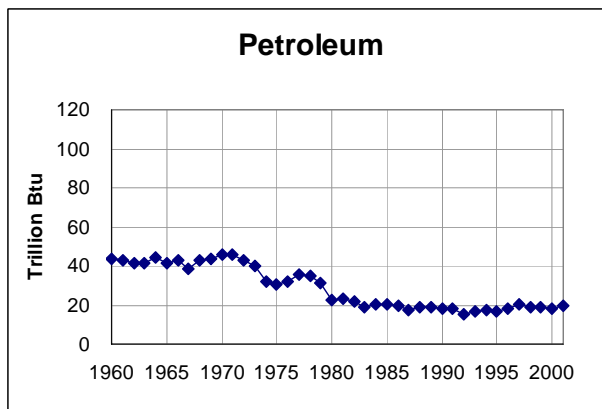
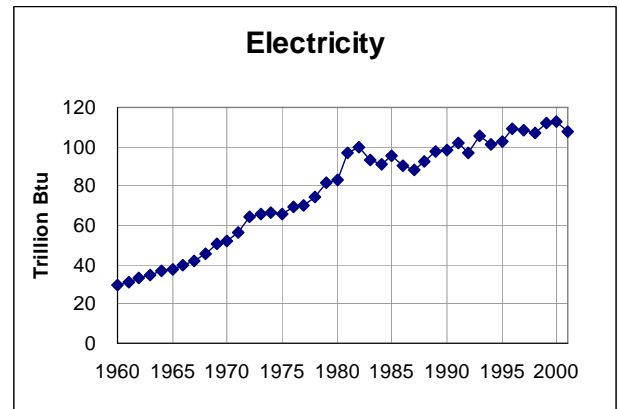
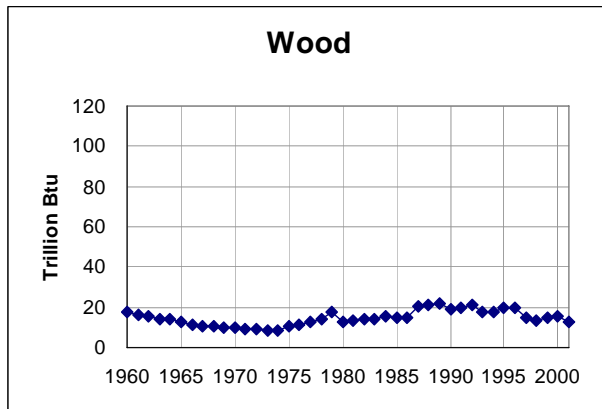
1. Energy expenditures include expenditures by households and businesses, and for personal and business transportation.
2. Because there was a change in definitions for industry classifications used in the definition of gross state product in 1997 (from SIC to NAICS), an exact comparison of energy intensity from 1980 to 2001 is not possible.

Links

No links to more current information

8. Residential End-Use Energy Consumption by Fuel

GROWTH IN HOUSEHOLD ELECTRICITY CONSUMPTION HAS SLOWED IN THE LAST 20 YEARS, WHILE GROWTH IN THE USE OF NATURAL GAS FOR SPACE AND WATER HEATING HAS ACCELERATED. OIL CONSUMPTION HAS DECLINED SIGNIFICANTLY SINCE THE EARLY 1970S, WHILE WOOD USE DECLINED OVER THE LAST FIVE YEARS.



Residential End-Use Energy Consumption by Fuel
Source: EIA SEDS

Source: Energy Information Administration's State Energy Data System

Residential End-Use Energy Consumption by Fuel

Units: Billion Btu

	Coal	Electricity	Natural Gas	Petroleum	Wood	Total
1960	2437	29871	8281	43930	17768	102287
1961	2751	31082	8798	43005	16512	102147
1962	2069	33303	10283	41454	15446	102554
1963	1774	34479	13529	41309	14448	105538
1964	1712	36531	18602	44596	14035	115476
1965	1899	37582	18689	41475	12487	112131
1966	1742	39783	21861	43026	11627	118038
1967	1216	41750	24619	38661	10888	117134
1968	856	45816	27975	42999	10544	128189
1969	843	50575	32369	43956	10182	137926
1970	428	52390	33685	45963	9580	142046
1971	518	56371	35800	45743	9219	147652
1972	304	64641	40756	42644	8944	157289
1973	146	65694	38328	39774	8204	152146
1974	93	66181	37195	32346	8273	144088
1975	117	65541	35792	30646	10251	142347
1976	125	69301	33674	31982	11232	146315
1977	832	70389	31907	35558	12848	151535
1978	912	74791	28743	35129	14276	153851
1979	566	81908	34398	31063	17372	165308
1980	770	83406	31285	22602	13057	151120
1981	500	97158	28191	22984	13194	162027
1982	655	99483	30688	21827	14226	166879
1983	801	93030	27116	18899	14044	153890
1984	906	91184	30558	20545	15530	158724
1985	1114	95306	34320	20010	15143	165893
1986	451	90429	31093	19994	14740	156707
1987	270	87938	30782	17618	20258	156866
1988	563	92818	35888	18670	21043	168981
1989	418	97764	39597	18722	21827	178702
1990	287	98296	41556	18242	18988	177754
1991	323	101982	47655	17872	20004	188222
1992	365	97023	44472	15495	21048	178799
1993	462	105540	55290	16677	17986	196356
1994	290	101244	55431	17528	17630	192522
1995	229	102862	54993	16640	19567	194692
1996	65	109226	65110	17999	19534	212331
1997	54	108328	64829	20232	14988	208822
1998	40	107008	64823	18819	13569	204639
1999	52	111972	75552	18757	14506	221208
2000	57	112718	74834	17950	15189	221080
2001	63	107848	87362	19766	12968	228319

Electricity accounted for a little less than half of residential energy consumption in 2001, but average electricity use per household has declined 20% since 1982. Growth in natural gas consumption has accelerated: residential sector gas use grew at 1.9% per year between 1980 and 1985, 3.9% per year between 1985 and 1990, 5.8% per year between 1990 and 1995, and 8.0% from 1995 to 2001. From 1980 to 2001 the natural gas share of residential energy consumption rose from 20% to 38%. This reflects increased use of natural gas for space and water heating, replacing both electricity and petroleum. Petroleum use (mostly heating oil) fell from more than 43% of household consumption in 1960 to less than 9% in 1999.

Consumption of firewood grew in the late 1970s in response to high heating oil prices. After remaining relatively stable from the mid-1980s to mid-1990s, wood use has declined 34% during the last five years.

Note:

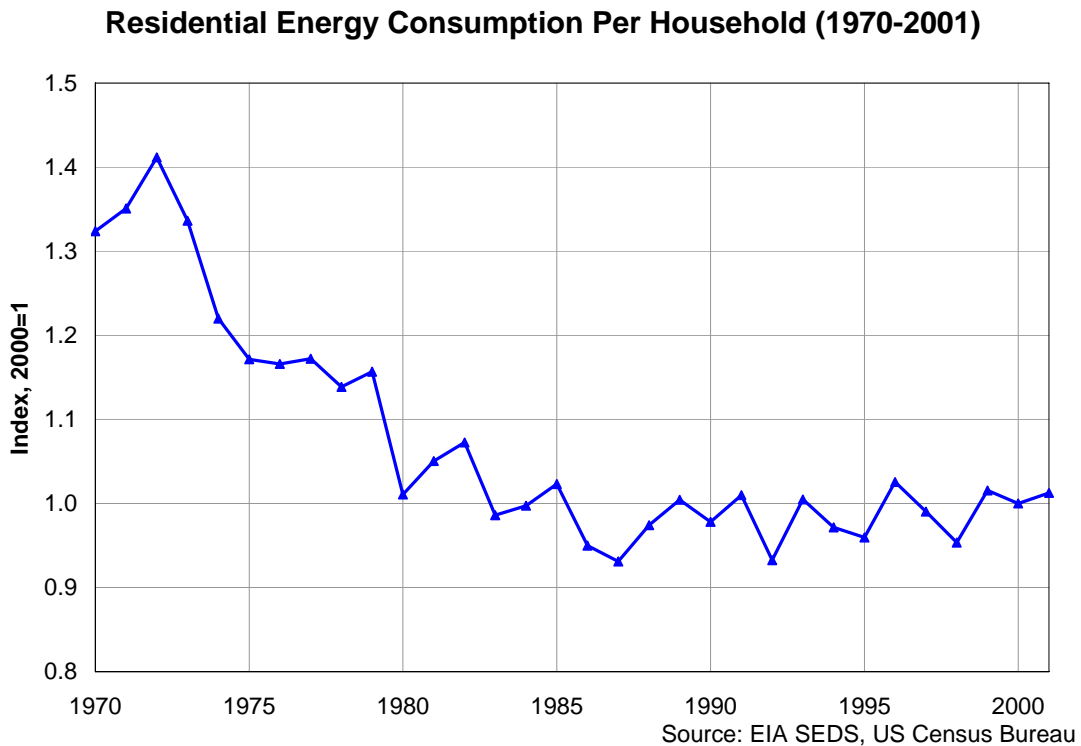
The primary petroleum products consumed in households are heating oil (No. 2 distillate oil) and propane. Both are consumed mainly for space heating, though propane can also be used for cooking and water heating. Residential sector energy use does not include energy consumption for personal transportation.

Links:

No links to more current information

9. Residential Household Energy Intensity

ENERGY CONSUMPTION IN WASHINGTON HOUSEHOLDS DECLINED BY A THIRD BETWEEN 1972 AND 1987, INDICATING AN IMPROVEMENT IN HOUSEHOLD ENERGY INTENSITY. THERE HAS BEEN NO IMPROVEMENT SINCE. CONSUMPTION PER HOUSEHOLD IN 2001 WAS SIMILAR TO 1985.



Sources: Energy Information Administration's State Energy Data System; U.S. Bureau of the Census

Residential Household Energy Intensity				
Units:	Billion Btu		billion Btu/hshld	
	Total	Washington State Households	Residential Consumption per household	Index 2000=1
1970	142046	1,105,587	0.128480	1.32
1971	147651.9	1,126,149	0.131112	1.35
1972	157288.5	1,148,000	0.137011	1.41
1973	152145.7	1,173,000	0.129706	1.34
1974	144088.4	1,217,000	0.118396	1.22
1975	142347.4	1,252,000	0.113696	1.17
1976	146315	1,293,000	0.113159	1.17
1977	151534.6	1,332,000	0.113765	1.17
1978	153851.5	1,392,000	0.110525	1.14
1979	165307.7	1,472,256	0.112282	1.16
1980	151119.9	1,540,510	0.098097	1.01
1981	162027.1	1,588,990	0.101969	1.05
1982	166878.9	1,602,698	0.104124	1.07
1983	153890.2	1,607,643	0.095724	0.99
1984	158723.7	1,639,572	0.096808	1.00
1985	165893.2	1,670,475	0.099309	1.02
1986	156707.2	1,699,633	0.092201	0.95
1987	156865.7	1,735,783	0.090372	0.93
1988	168980.9	1,787,028	0.094560	0.97
1989	178701.9	1,833,019	0.097490	1.00
1990	177754.3	1,872,404	0.094934	0.98
1991	188222.3	1,920,031	0.098031	1.01
1992	178798.8	1,975,360	0.090515	0.93
1993	196356.3	2,013,327	0.097528	1.00
1994	192522.1	2,041,493	0.094305	0.97
1995	194691.9	2,090,360	0.093138	0.96
1996	212330.6	2,132,950	0.099548	1.03
1997	208822	2,172,069	0.096140	0.99
1998	204638.9	2,210,949	0.092557	0.95
1999	221207.8	2,244,324	0.098563	1.02
2000	221080.1	2,277,698	0.097063	1.00
2001	228319.2	2,323,138	0.098280	1.01

Washington households became less energy intensive between 1972 and 1987, but energy intensity has not improved since. The 1970s were characterized by diminished oil and natural gas consumption, with natural gas use per household falling by 33% between 1970 and 1980. Oil consumption dropped from 300 gallons per household in 1970 to 85 in 1983, with half the decline occurring after the second oil shock in 1978. These declines in natural gas and petroleum use were likely due to improvements in efficiency (e.g. adding

insulation), conservation in response to higher prices, and fuel switching. The data indicate an increased reliance on wood and electricity as space heating fuels during the late 1970s and early 1980s.

Concerted efforts to improve residential efficiency through building standards and codes began in earnest in the mid-80s. However, there is little evidence of further declines in household energy use during this period. Presumably gains in efficiency due to building standards and codes are being offset by larger homes, more widespread use of air conditioning, and the proliferation of electricity-using appliances, computers, and entertainment systems. Without the codes and standards, household energy use would be higher. Note that these data do not include energy used for personal transportation, which has increased markedly during the last fifteen years.

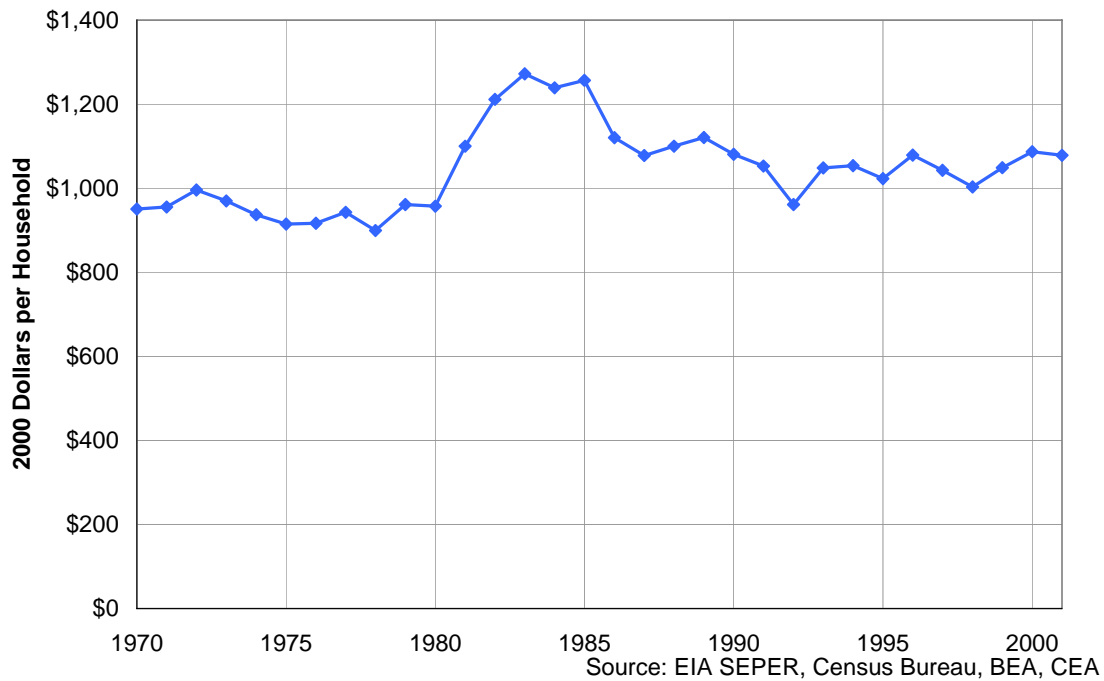
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10. Residential Household Energy Bill without Transportation

ADJUSTED FOR INFLATION, THE AVERAGE WASHINGTON HOUSEHOLD SPENT 13% MORE FOR HOME ENERGY IN 2001 THAN IN 1970. IMPROVEMENTS IN HOUSEHOLD ENERGY EFFICIENCY AND FUEL SWITCHING TO LESS EXPENSIVE ENERGY SOURCES HAVE OFFSET HIGHER ELECTRICITY PRICES.

Residential Energy Expenditures per Household (1970-2001)



Sources: Energy Information Administration's State Energy Price and Expenditure Report; U.S. Bureau of the Census; and President's Council of Economic Advisors - 2005 Annual Economic Report of the President

Residential Household Energy Bill without Transportation				
Units:	millions of dollars		dollars/household	
	Residential Expenditures	Washington State Households	Residential Expenditures per Household	Residential Expenditures per Household in 2000 dollars
1970	283.36792	1,105,587	\$ 256.31	\$ 950.55
1971	304.95592	1,126,149	\$ 270.80	\$ 955.15
1972	338.68031	1,148,000	\$ 295.02	\$ 996.04
1973	356.47342	1,173,000	\$ 303.90	\$ 969.59
1974	394.03713	1,217,000	\$ 323.78	\$ 937.24
1975	432.51181	1,252,000	\$ 345.46	\$ 914.85
1976	473.49499	1,293,000	\$ 366.20	\$ 916.92
1977	535.36504	1,332,000	\$ 401.93	\$ 942.74
1978	571.78761	1,392,000	\$ 410.77	\$ 899.56
1979	702.77095	1,472,256	\$ 477.34	\$ 961.05
1980	809.16763	1,540,510	\$ 525.26	\$ 957.18
1981	1046.75186	1,588,990	\$ 658.75	\$ 1,099.83
1982	1229.12659	1,602,698	\$ 766.91	\$ 1,211.63
1983	1340.12213	1,607,643	\$ 833.59	\$ 1,272.37
1984	1377.80520	1,639,572	\$ 840.34	\$ 1,239.04
1985	1464.33784	1,670,475	\$ 876.60	\$ 1,256.59
1986	1358.13436	1,699,633	\$ 799.08	\$ 1,120.13
1987	1375.38871	1,735,783	\$ 792.37	\$ 1,077.66
1988	1494.63166	1,787,028	\$ 836.38	\$ 1,099.88
1989	1621.58096	1,833,019	\$ 884.65	\$ 1,120.75
1990	1662.03599	1,872,404	\$ 887.65	\$ 1,080.60
1991	1714.70160	1,920,031	\$ 893.06	\$ 1,052.69
1992	1648.83651	1,975,360	\$ 834.70	\$ 961.33
1993	1872.91592	2,013,327	\$ 930.26	\$ 1,048.42
1994	1948.57468	2,041,493	\$ 954.49	\$ 1,053.71
1995	1977.71148	2,090,360	\$ 946.11	\$ 1,023.01
1996	2166.36373	2,132,950	\$ 1,015.67	\$ 1,078.83
1997	2161.77611	2,172,069	\$ 995.26	\$ 1,042.81
1998	2130.67026	2,210,949	\$ 963.69	\$ 1,003.22
1999	2296.79825	2,244,324	\$ 1,023.38	\$ 1,049.02
2000	2476.28036	2,277,698	\$ 1,087.19	\$ 1,087.19
2001	2919.64618	2,323,138	\$ 1,100.00	\$ 1,078.49

In 2001, the average Washington household spent the inflation-adjusted sum of \$1,078 (2000 dollars) for electricity, natural gas, and petroleum delivered to the home, roughly \$128 more than in 1970. This outward similarity masks significant changes in the composition of household energy expenditures over the last 25 years. Increased emphasis on energy conservation and fuel switching from heating oil to wood helped to mitigate the impact of the oil shocks of the 1970s on the home energy bill of Washington

households. However, there is no immediate substitute for electricity, so when electricity prices increased by 62% between 1980 and 1983, due largely to the inclusion in rates of the WPPSS nuclear bonds, the average household electricity bill increased by a like amount.

Over time, energy efficiency and fuel switching have helped reduce reliance on relatively expensive electricity. Most new homes are being built with natural gas heat and water heating (78% in 1998) and numerous existing households have switched to natural gas as well. Electricity usage per household fell 18% between 1985 and 2001 while natural gas usage increased 83%. Switching to a less expensive fuel produces significant cost savings.

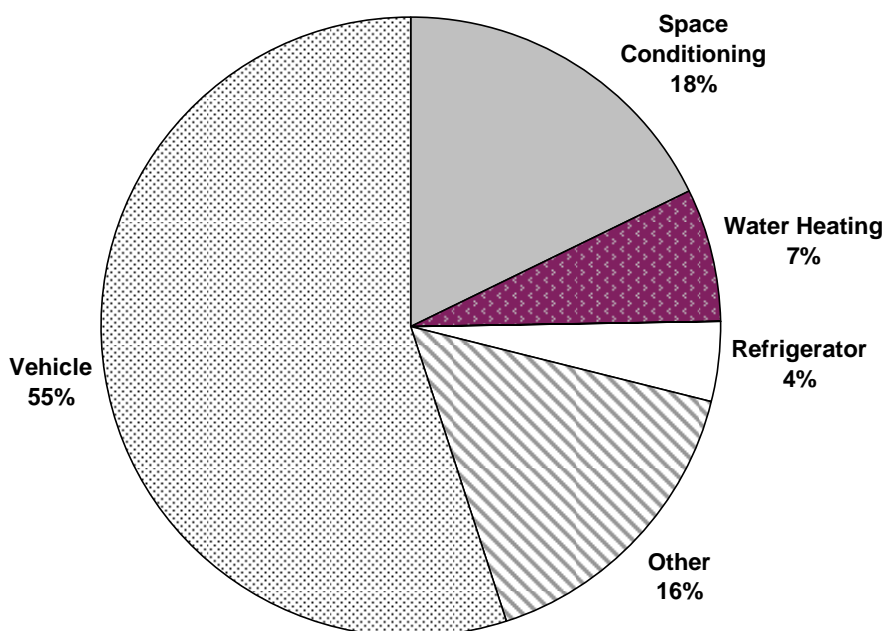
Links

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11. Residential Household Energy Bill with Transportation

ADDING ENERGY USED FOR PERSONAL TRANSPORTATION MORE THAN DOUBLES THE ANNUAL ENERGY BILL FOR THE AVERAGE WASHINGTON HOME TO \$2,446 (2001).

Household Energy Bill by End Use 2001 (\$2,446)



Source: EIA RECS

Sources: Energy Information Administration's State Energy Data System; Residential Energy Consumption Survey; Residential Transportation Energy Consumption Survey

Residential Household Energy Bill with Transportation		
Units:	\$	
Household Energy Expenditures with Transportation		
Space Conditioning	435	18%
Water Heating	172	7%
Refrigerator	98	4%
Other	395	16%
Vehicle	1346	55%
Total Household and Vehicle Energy Expenditures.	2446	

Most views depicting residential energy data do not include the major component of consumption and expenditure at most homes – household vehicles. The average household in Washington spent over half of its energy budget fueling vehicles for transportation in 2001. This share will likely continue to be significant. While homes have become more energy efficient, people are likely to maintain or increase current levels of driving and they are using less fuel-efficient vehicles (see Indicators #17 and #18).

After personal transportation, major categories of household energy expenditures include space conditioning (heating, cooling, and ventilation), other uses such as lighting, household appliances, and electronic equipment, water heating, and refrigerators.

Notes:

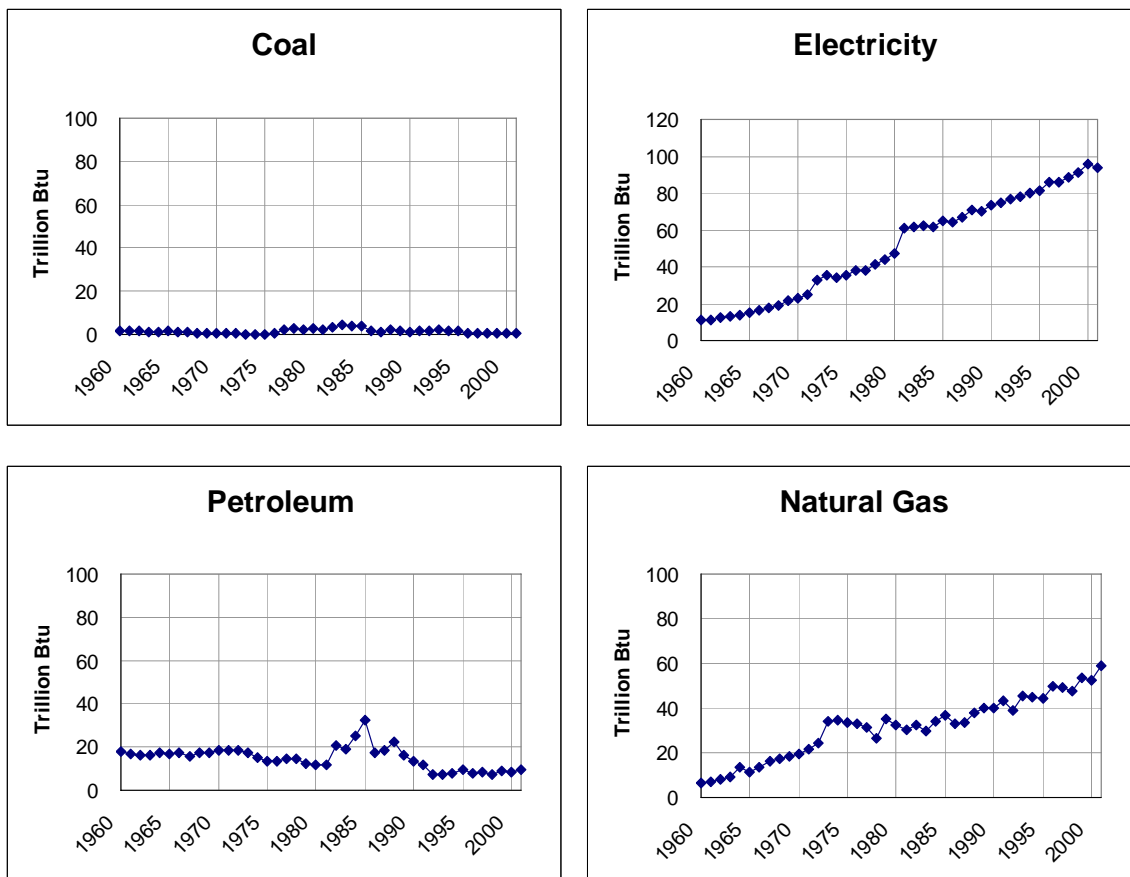
These figures apportion the household energy bill to end-use shares using information from the 2001 Residential Energy Consumption Survey and the 1994 Residential Transportation Energy Consumption Survey. Because more recent transportation energy use data are not available, the values from the 1994 survey are adjusted to reflect current gasoline price, fuel efficiency, and travel values.

Links:

No links to more current information

12. Commercial End-Use Energy Consumption by Fuel

ELECTRICITY AND NATURAL GAS USE IN THE COMMERCIAL SECTOR GREW AT AN AVERAGE ANNUAL RATE OF MORE THAN 5% FROM 1960 TO 2001. ELECTRICITY ACCOUNTED FOR A LITTLE LESS THAN 57% OF END-USE ENERGY CONSUMPTION IN THE COMMERCIAL SECTOR IN 2001 WHILE NATURAL GAS MADE UP THE BULK OF THE REST.



Commercial Sector End-Use Consumption by Fuel
Source: EIA SEDS

Sources: Energy Information Administration's State Energy Data System

Commercial End-Use Energy Consumption by Fuel

Units: Billion Btu

Year	Coal	Electricity	Natural Gas	Petroleum	Wood	Total
1960	1693	10987	6704	17628	337	37349
1961	1912	11417	7218	16866	314	37726
1962	1438	12436	8222	16241	293	38630
1963	1285	13145	8974	16145	274	39822
1964	1239	13843	13254	17514	266	46116
1965	1433	14943	11457	16531	236	44601
1966	1314	16438	13601	17183	220	48756
1967	917	17671	16086	15529	209	50413
1968	673	19310	17251	17231	202	54666
1969	662	21573	18230	17563	193	58222
1970	336	22940	19507	18422	180	61386
1971	540	24714	21746	18408	174	65580
1972	403	32984	24533	18355	169	76445
1973	248	35177	33982	17429	155	86992
1974	197	34310	34782	14958	157	84404
1975	274	35405	33331	13456	194	82660
1976	307	37771	32950	13270	212	84511
1977	2140	37733	31294	14730	244	86140
1978	3053	41188	26536	14737	272	85786
1979	2266	44139	34942	12291	330	93967
1980	2896	47239	32358	11946	313	94753
1981	2279	60875	30062	11926	317	105459
1982	3196	61908	32179	20406	341	118031
1983	4206	62255	29963	19264	337	116025
1984	3863	61411	33828	24912	370	124384
1985	3949	64709	36877	32294	404	138234
1986	1511	64199	32951	17373	454	116487
1987	904	67209	33434	18497	690	120733
1988	1995	70650	37625	22441	761	133472
1989	1572	70412	39744	15956	808	129197
1990	1147	73391	39831	13171	1207	129697
1991	1470	74951	43032	11625	1273	133254
1992	1661	76880	39050	7089	1371	126807
1993	2103	78337	45285	7117	1445	135010
1994	1641	79761	44832	7745	1477	136171
1995	1535	81586	44367	9229	1477	139205
1996	476	85784	49998	7977	1602	146837
1997	440	85952	48964	8537	1646	146569
1998	325	88241	47685	7052	1631	145993
1999	380	91082	53458	8734	1798	156605
2000	462	95697	52610	8237	1819	159861
2001	508	93927	59155	9377	1387	165255

Electricity and natural gas are the dominant fuels in Washington's commercial sector. With escalating use of electricity-consuming equipment such as computers, printers, and photocopiers, the commercial sector became increasingly reliant on electricity during the 1970's and 1980's. Sector electricity consumption has quadrupled since 1970, although the rate of growth is declining and consumption dropped for the first time in 2001.

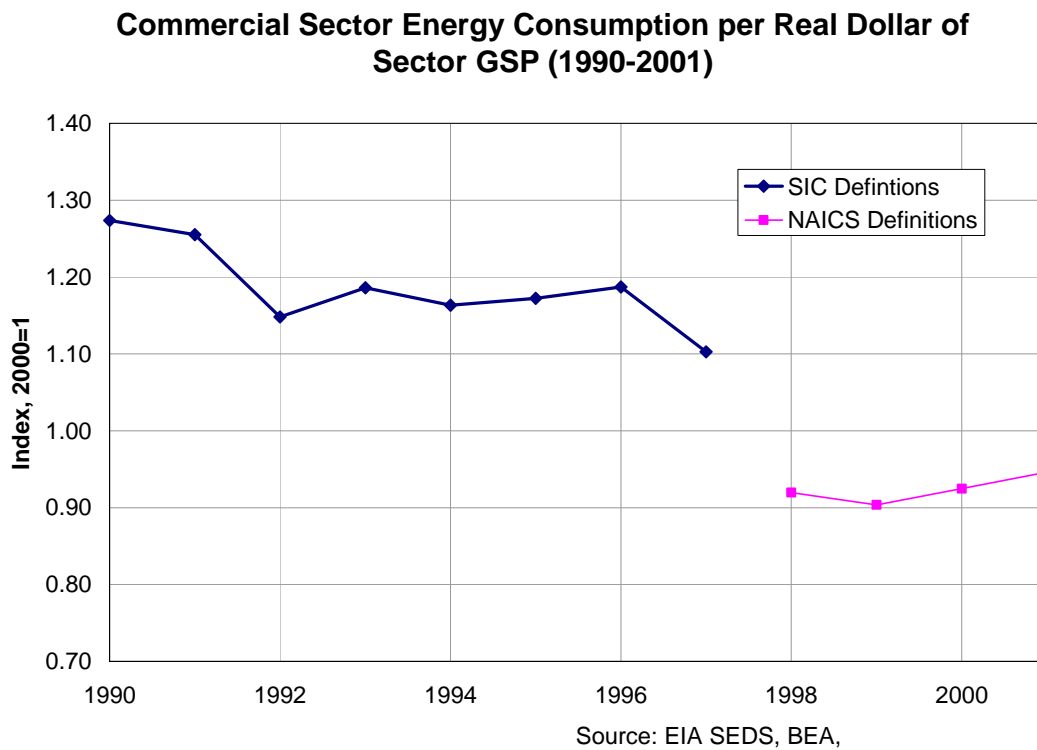
Growth in commercial sector natural gas use stagnated in the late 1970s and early 1980s, but has grown since. Natural gas use in 2001 was three times the amount in 1970. In contrast, petroleum consumption is half of the 1970 level, declining from 30% of commercial sector energy consumption in 1970 to 6% in 2001.

Links

No links to more current information

13. Commercial Sector Energy Intensity

AFTER DECLINING FOR MUCH OF THE PREVIOUS DECADE, COMMERCIAL SECTOR ENERGY CONSUMPTION HAS STAYED FAIRLY CONSTANT RELATIVE TO ECONOMIC OUTPUT FOR THE LAST SEVERAL YEARS.



Sources: Energy Information Administration's State Energy Data System; U.S. Department of Commerce, Bureau of Economic Analysis

Commercial Sector Energy Intensity

Units:	billion Btu	millions of chained 2000\$	thousand Btus/\$ (2000)	2000=1
Year	Total	Commercial Sector Gross State Product	Commercial Consumption per Sector GSP	Index
1990	129697	101837	1.27	1.38
1991	133254	106151	1.26	1.36
1992	126807	110449	1.15	1.24
1993	135010	113835	1.19	1.28
1994	136171	117037	1.16	1.26
1995	139205	118728	1.17	1.27
1996	146837	123684	1.19	1.28
1997	146569	132925	1.10	1.19
1998	145993	158751	0.9196	0.99
1999	156605	173289	0.9037	0.98
2000	159861	172871	0.9247	1.00
2001	165255	174602	0.9465	1.02

Note there was a change in industry definitions from SIC to NAICS classification that results in a discontinuity in the data from 1997 to 1998. Thus data before and after 1998 are not directly comparable.

Washington's commercial sector has become less energy intensive for most of the last 15 years. From 1990 to 1997 commercial sector energy consumption grew only 13% while the value of all goods and services produced by the commercial sector grew 30%. This decline in commercial sector energy intensity can be attributed to growth in the economy, shifts to less energy intensive businesses, increased productivity, and improvements in the efficiency of buildings, lighting, and equipment.

However, this trend appears to have changed since 1998, with growth in energy use slightly exceeding growth in commercial sector gross state product from 1998 to 2001¹. Thus commercial sector energy intensity increased several percent.

Notes:

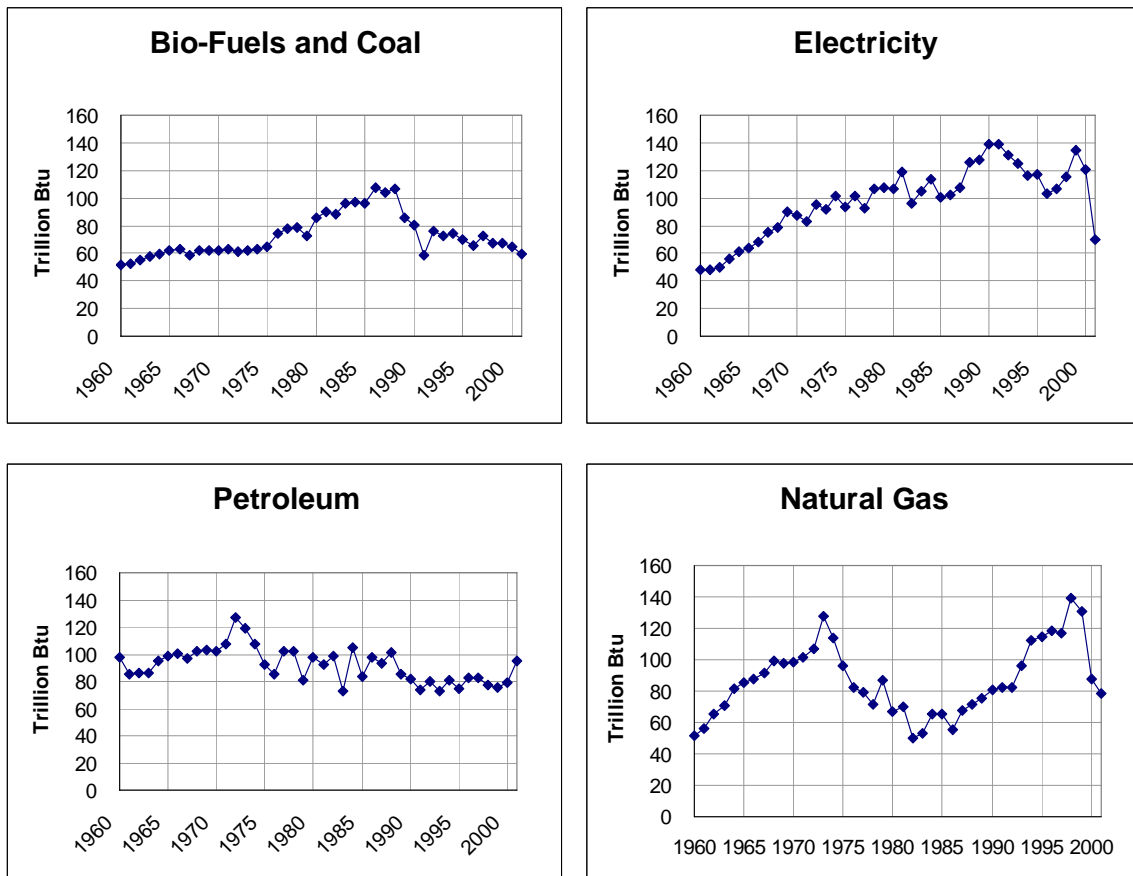
1. Because there was a change in definitions for industry classifications used in the definition of gross state product in 1997 (from SIC to NAICS), an exact comparison of values before and after 1997 is not possible.

Links

No links to more current information

14. Industrial End-Use Energy Consumption by Fuel

INDUSTRIAL ENERGY CONSUMPTION IN WASHINGTON IS MORE DIVERSIFIED AMONG THE DIFFERENT FUELS THAN THE OTHER SECTORS. TOTAL INDUSTRIAL CONSUMPTION DECLINED 26% BETWEEN 1999 AND 2001 – NATURAL GAS AND ELECTRICITY USE DECLINED SHARPLY WHILE PETROLEUM USE GREW.



Industrial Sector End-Use Energy Consumption by Fuel
Source: EIA SEDS

Sources: Energy Information Administration's State Energy Data System

Industrial End-Use Energy Consumption by Fuel						
Units:	billion Btu					
	BioMass	Coal	Electricity	Natural Gas	Petroleum	Total
1960	40420	10914	47682	51795	97425	248235
1961	41039	10997	48469	56353	85731	242589
1962	43327	12097	50054	65314	86478	257269
1963	47575	10097	55564	70931	86310	270478
1964	50929	8844	60818	81373	94740	296704
1965	53526	8774	63816	85330	98507	309954
1966	55264	8055	68229	87865	100213	319626
1967	52512	6117	75160	91920	96658	322366

1968	56536	5436	78770	99159	101877	341779
1969	56846	5551	90416	98060	103112	353985
1970	56760	5087	87107	98270	101864	349089
1971	57775	5331	83086	101253	107807	355252
1972	57861	3436	95354	106733	126955	390339
1973	57878	3922	91404	127904	118978	400085
1974	56743	6482	101468	113562	107138	385392
1975	53853	10909	93545	96012	92884	347204
1976	59942	14240	101051	82037	85270	342541
1977	65222	12412	92460	79413	102368	351875
1978	66495	12184	106956	71351	102146	359132
1979	59753	12483	107843	86765	80730	347574
1980	78286	7093	107021	66999	97750	357149
1981	82627	7669	118487	70030	92173	370985
1982	79934	7946	96341	49617	98640	332479
1983	90288	5578	105172	53071	72563	326671
1984	92112	4516	113770	65616	104463	380476
1985	91723	4492	100419	65703	83659	345996
1986	99818	7383	102495	55594	97742	363032
1987	97960	5894	107809	67874	93528	373066
1988	101142	5273	125934	71217	101032	404598
1989	80755	4949	127504	75602	85040	373851
1990	74960	5201	138909	80777	82053	381900
1991	54735	4276	139343	82208	73691	354252
1992	72538	3370	130787	82404	80361	369461
1993	68741	3509	124752	95795	72711	365509
1994	70387	3875	116230	112234	81329	384055
1995	65603	4231	116951	114645	74759	376189
1996	62373	2980	103184	118648	82413	369598
1997	69545	3223	106959	116582	82830	379139
1998	64581	2690	115351	139312	77504	399438
1999	65340	2183	134770	131046	75442	408780
2000	61935	2815	120818	87312	78772	351652
2001	56981	2900	69980	78291	95113	303265

Unlike the residential and commercial sectors, which rely primarily on electricity and natural gas, or the transportation sector which consumes almost exclusively petroleum fuels, energy consumption in Washington's industrial sector is quite diversified. Petroleum accounted for 31% of industrial consumption in 2001, while electricity and natural gas accounted for about a quarter each and biofuels¹ accounted for most of the rest. Coal use only accounted for 1% of industrial consumption in 2001 declining from a high of 14 trillion Btus in 1976 to 2.9 trillion Btus in 2001.

Between 1999 and 2001 industrial electricity use declined almost 50% and natural gas use declined 40% while petroleum use grew 24%. This reflected the decline in aluminum production due to high electricity prices (and low aluminum prices) and a shift from natural gas to petroleum due to high natural gas prices.

Total industrial sector energy use grew modestly from 1990 to 1999 at about 1% per year. Consumption in 1999 was slightly more than the previous year of highest consumption in 1988. However, consumption dropped 26% by 2001. Energy consumption in the industrial sector tends to vary more than the other sectors with peaks and valleys that mirror the economy. When production declines, energy use declines. High energy prices can also contribute to lower production, particularly in energy intensive industries.

Notes:

1. Bio-fuels consumed in the industrial sector comprise mainly wood and wood waste products such as black liquor or hog fuel. These fuels are primarily burned in industrial boilers to make steam, which can be used to fire industrial processes or to generate electricity for on-site use.

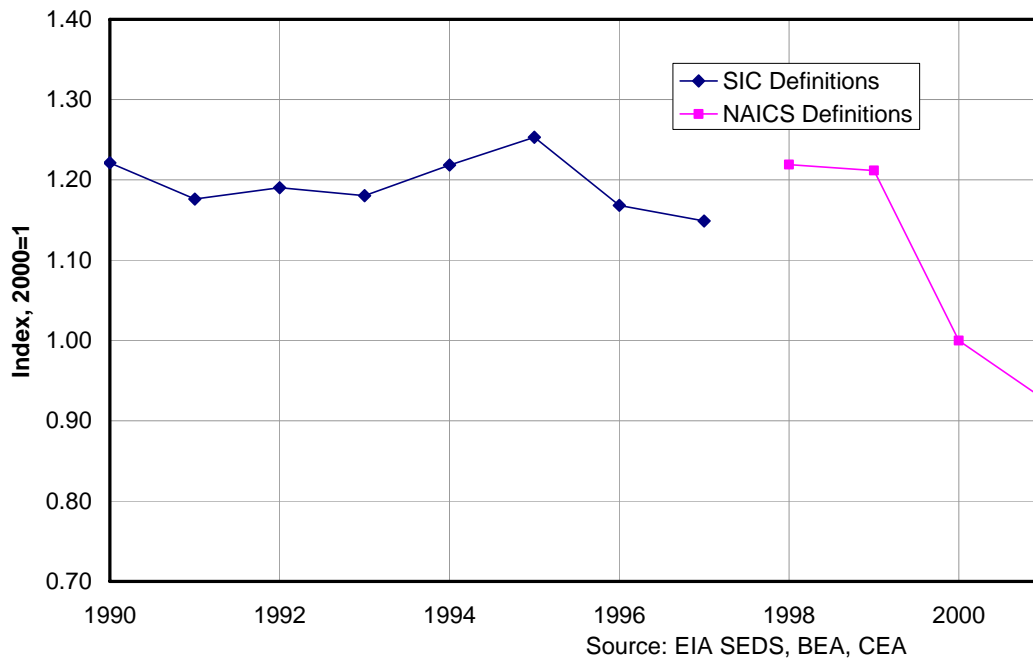
Links

No links to more current information

15. Industrial Sector Energy Intensity

AFTER STAYING RELATIVELY CONSTANT DURING THE 1990S, ENERGY INTENSITY IN WASHINGTON'S INDUSTRIAL SECTOR DECLINED BETWEEN 1999 AND 2001. THIS REFLECTED A DECLINE IN PRODUCTION FOR ENERGY INTENSIVE INDUSTRIES SUCH AS ALUMINUM SMELTING.

**Industrial Energy Consumption per Real Dollar of Sector GDP
(1990-2001)**



Sources: Energy Information Administration's State Energy Data System; U.S. Department of Commerce, Bureau of Economic Analysis

Industrial Energy Intensity				
Units:	billion Btu	millions of chained 2000\$	thousand Btus/\$ (2000)	2000=1
	Total Industrial Consumption	Industrial Sector Gross State Product	Industrial Consumption per Sector GDP	Index
1990	381900	34633	11.03	1.22
1991	354252	33361	10.62	1.18
1992	369461	34379	10.75	1.19
1993	365509	34292	10.66	1.18
1994	384055	34908	11.00	1.22
1995	376189	33249	11.31	1.25
1996	369598	35038	10.55	1.17

1997	379139	36547	10.37	1.15
1998	399438	36287	11.01	1.22
1999	408780	37361	10.94	1.21
2000	351652	38946	9.03	1.00
2001	303265	36228	8.37	0.93

Note: there was a change in industry definitions from SIC to NAICS classification that results in a discontinuity in the data for gross state product from 1997 to 1998. Thus data before and after 1998 are not directly comparable.

Washington's industrial sector is less energy-intensive than it was two decades ago when comparing industrial energy use to industrial gross state product. However, energy intensity has not consistently declined over this period. After improvements during the 1980s, energy intensity did not change much during the 1990s before dropping 23% between 1999 and 2001. While some of the improvement in energy intensity over the years may be due to gains in energy efficiency, it generally reflected a decline in energy intensive industries in Washington. This was particularly true in the period from 1999 to 2001 when industrial energy use dropped 26%, but industrial gross state product only declined 3%. High electricity prices along with low aluminum prices contributed to a significant decline in Washington's aluminum production. Aluminum production is energy intensive (high energy use relative to product value) and relies on low-cost electricity in the production process. At the same time, natural gas prices rose. High energy prices impact energy intensive industries the most and can contribute to declines in production, particularly when it is not possible to switch to a less expensive fuel source.

Notes:

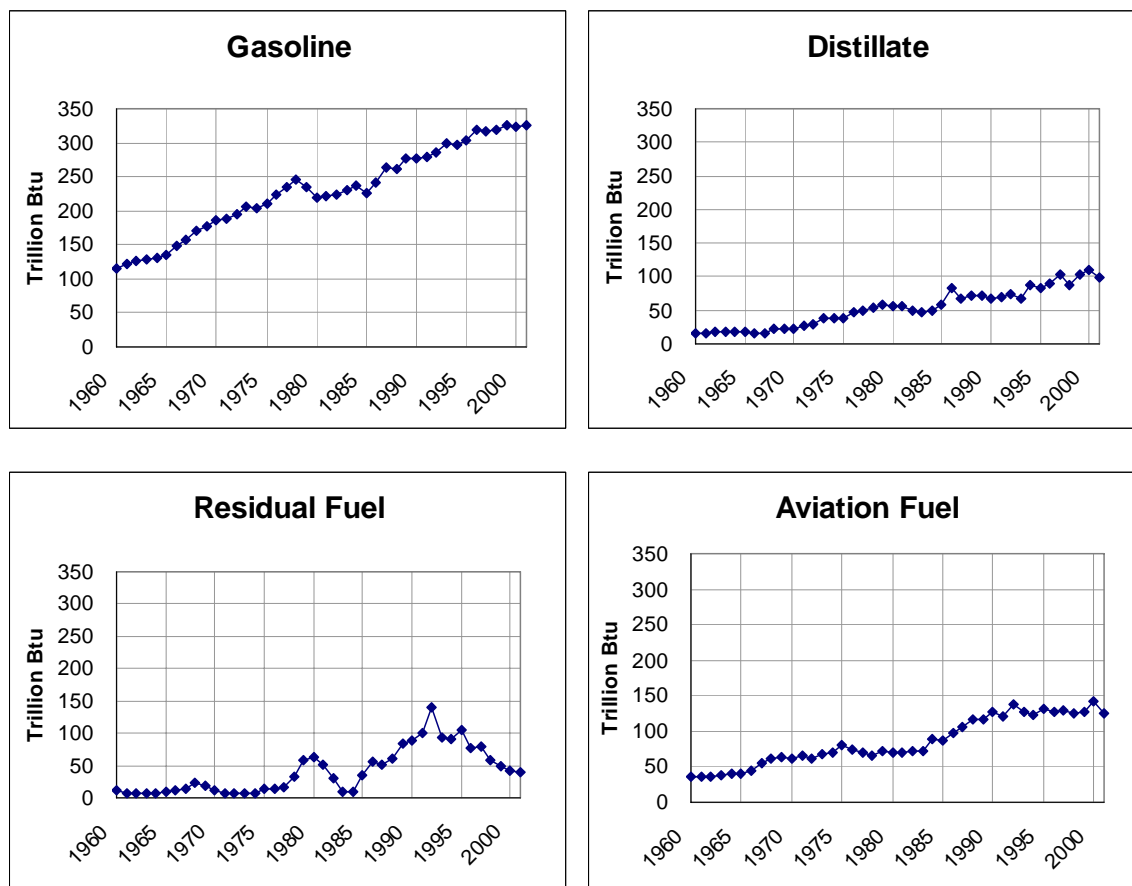
Electricity consumption for the industrial sector includes consumption for the direct service industries (DSIs) that purchase electricity directly from the Bonneville Power Administration.

Links

No links to more current information

16. Transportation End-Use Energy Consumption by Fuel

GASOLINE ACCOUNTS FOR OVER HALF OF TRANSPORTATION SECTOR ENERGY USE IN WASHINGTON. WHILE WASHINGTONIANS TEND TO DRIVE MORE THAN OTHER AMERICANS, WASHINGTON'S STATUS AS A MAJOR SEAPORT AND AVIATION HUB MEANS HIGHER CONSUMPTION OF AVIATION AND MARINE FUELS AS WELL.



Sources: Energy Information Administration's State Energy Data System

Transportation End-Use Energy Consumption by Fuel				
Units:	trillion Btu			
Year	Gasoline	Distillate	Aviation Fuel	Residual Fuel
1960	115.84	14.99	35.32	10.73
1961	121.01	15.72	36.85	7.68
1962	127.34	18.19	35.98	7.18
1963	127.55	17.81	37.92	7.97
1964	130.07	19.07	39.83	7.92
1965	135.98	17.60	40.35	9.07
1966	148.44	16.33	43.95	11.73
1967	158.11	15.84	54.56	14.53
1968	169.89	21.42	61.56	23.57
1969	177.75	23.31	64.00	17.65
1970	184.97	23.04	61.10	12.73

1971	188.92	26.17	66.55	7.53
1972	195.38	29.94	61.13	6.09
1973	205.19	38.88	67.38	7.26
1974	204.65	37.63	70.50	7.92
1975	211.15	38.54	80.13	13.26
1976	223.19	46.62	74.22	14.67
1977	234.66	48.55	69.22	16.36
1978	245.04	53.59	65.83	31.85
1979	235.06	58.70	72.73	59.40
1980	220.09	55.89	69.31	63.57
1981	222.45	56.17	69.36	51.32
1982	222.99	49.10	73.01	29.63
1983	231.10	46.51	73.10	10.32
1984	237.87	48.72	88.82	10.45
1985	225.72	59.06	87.63	34.53
1986	241.11	81.96	97.24	56.15
1987	263.71	67.89	106.10	51.12
1988	261.31	71.91	117.39	60.91
1989	277.65	72.89	116.97	84.49
1990	275.91	67.62	127.60	89.46
1991	279.75	68.52	121.60	99.74
1992	285.02	73.58	137.42	139.17
1993	298.43	68.03	126.59	93.13
1994	297.41	86.80	123.29	91.72
1995	303.63	82.03	131.53	104.06
1996	318.10	88.73	128.01	77.19
1997	315.69	102.91	128.33	79.07
1998	319.39	86.58	125.74	58.75
1999	325.23	103.49	127.05	47.84
2000	324.30	109.20	141.87	41.72
2001	324.62	98.58	124.44	39.42

Motor gasoline is the dominant transportation fuel, accounting for more than half of Washington's transportation energy consumption. Except for the period between 1978 and 1985 (when prices jumped significantly), gasoline consumption has steadily increased as demand for travel has outstripped gains in vehicle fuel efficiency. Gasoline consumption in 2001 was 75% greater than in 1970.

Consumption of distillate fuels in trucks, ships, and railroads grew at a faster rate than other transportation fuels, reaching levels in 2001 that were more than four times greater than 1970. However, the magnitude of this consumption increase was much less than the increase for motor gasoline. Aviation fuel consumption more than doubled between 1970 and 2001. In both these cases, consumption growth due to increased travel was greater than the savings from efficiency improvements in the transportation fleet using distillate or aviation fuels.

Residual fuel consumption is subject to price-induced volatility because it can be stored for long periods of time without degrading. Thus purchases of this fuel dropped when prices were high, but grew when prices were relatively low.

Notes:

Motor gasoline figures include some consumption for off-road uses such as recreational vehicles and agricultural uses. No. 2 distillate, also known as diesel fuel, is used by large trucks, ships, and railroads. The only transportation use for residual fuel is by very large ships.

Aviation fuel includes kerosene-based jet fuel used by major airlines, aviation gasoline consumed by smaller airplanes, and military jet fuel.

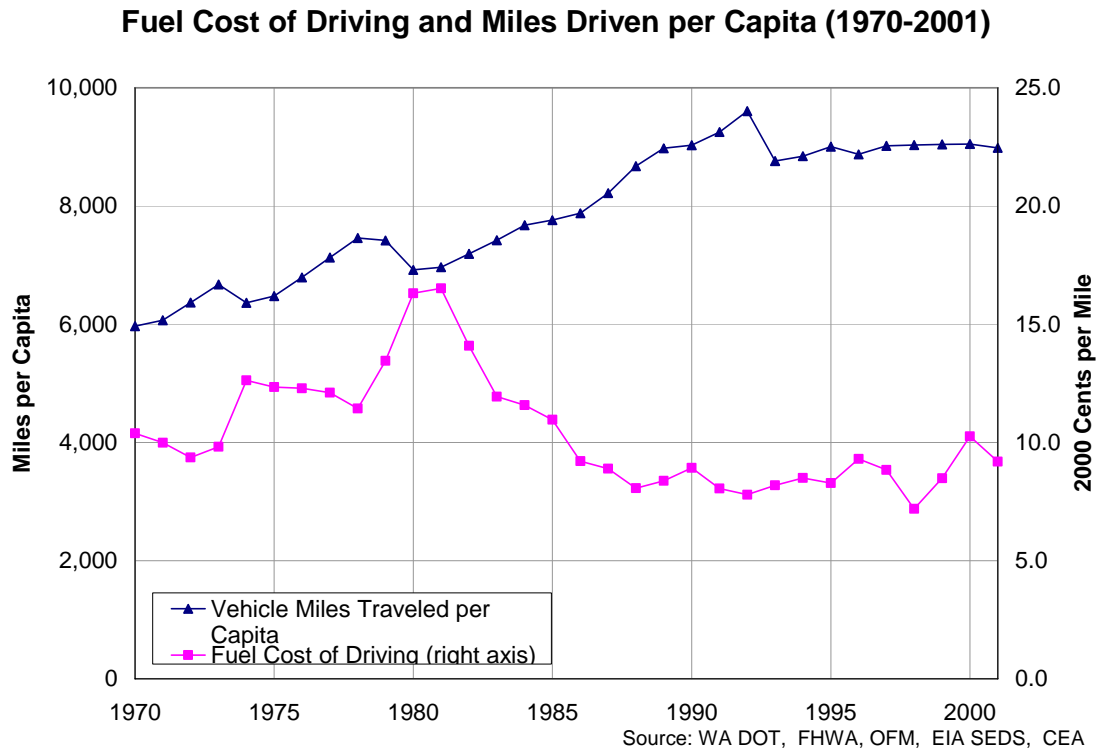
Links:

The monthly petroleum data spreadsheet on the Washington Energy Policy website contains more recent monthly petroleum price and sales data by fuel type.

http://www.cted.wa.gov/_CTED/documents/ID_1215_Publications.xls

17. Transportation Fuel Cost of Driving and Miles Driven

WASHINGTONIANS DROVE 51% MORE MILES PER CAPITA IN 2001 THAN THEY DID IN 1970. DURING THE SAME PERIOD THE FUEL COST OF DRIVING ROSE AND THEN DECLINED BELOW 1970 LEVELS.



Sources: Energy Information Administration's State Energy Data System; President's Council of Economic Advisors; Federal Highway Administration, Washington State Dept. of Transportation, Washington State Office of Financial Management.

Transportation Trends - Fuel Cost of Driving and Miles Driven per Capita		
Units:	miles/person	cents/mile
	Vehicle Miles Traveled per Capita	Fuel Cost of Driving (right axis)
1970	5,968	10.4
1971	6,066	10.0
1972	6,365	9.4
1973	6,671	9.8
1974	6,360	12.6
1975	6,476	12.3
1976	6,791	12.3
1977	7,128	12.1
1978	7,457	11.4
1979	7,416	13.4
1980	6,920	16.3
1981	6,962	16.5
1982	7,189	14.1
1983	7,421	11.9
1984	7,674	11.6
1985	7,759	11.0
1986	7,878	9.2
1987	8,219	8.9
1988	8,674	8.1
1989	8,975	8.4
1990	9,028	8.9
1991	9,250	8.0
1992	9,606	7.8
1993	8,761	8.2
1994	8,841	8.5
1995	9,003	8.3
1996	8,873	9.3
1997	9,017	8.8
1998	9,031	7.2
1999	9,041	8.5
2000	9,048	10.3
2001	8,982	9.2

This indicator juxtaposes the fuel cost of driving with miles driven per capita in Washington. Not surprisingly, these series exhibit an inverse relationship. The fuel cost of driving, calculated as real dollar highway energy expenditures divided by vehicle-miles traveled (VMT), spiked upward in 1974 and 1979-1980 as a result of the oil price shocks. VMT per capita dropped slightly in response to higher prices, as unnecessary driving was temporarily curtailed. However, long-term factors such as land-use patterns, commuting habits, and the long lifetimes of vehicles mean that large swings in fuel prices lead to only small changes in miles driven.

Increasing sales of more fuel-efficient vehicles in the early 1980s combined with declines in the price of highway fuels caused a rapid drop in the fuel cost of driving, from a high of 16.5¢ per mile in 1981 to 8.06¢ in 1988 (in 2000 dollars). However, real gasoline prices changed little in the next 10 years, and new vehicle fuel efficiency declined slightly, resulting in little change in the fuel cost of driving. Low gasoline prices helped push the fuel cost of driving to an historic low in 1998, but higher prices since then reversed this trend. By 2000 the fuel cost of driving had risen more than 40%. Meanwhile, per capita vehicle travel increased steadily during the 1980's, but has been relatively constant since 1992.

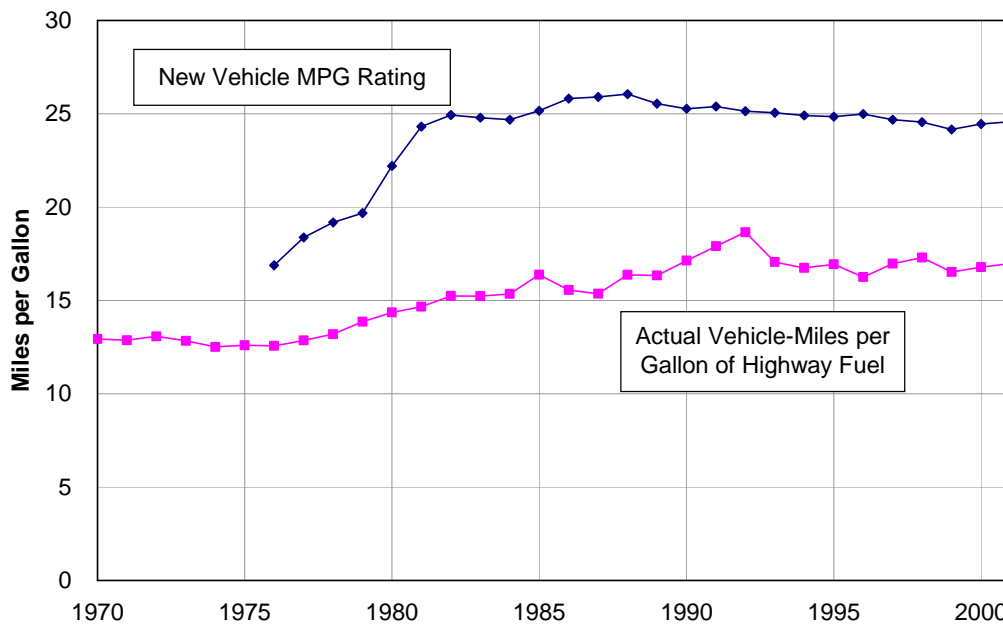
Links

No links to more current information (we could link this one to the gasoline prices indicator – I have not done that one yet)

18. Transportation Sector Energy Intensity

SPURRED BY HIGH GASOLINE PRICES AND IMPROVING NEW VEHICLE FUEL EFFICIENCY, THE FUEL EFFICIENCY OF WASHINGTON'S EXISTING VEHICLE FLEET INCREASED BY MORE THAN 45% BETWEEN 1975 AND 1992. THE INCREASING POPULARITY OF LESS FUEL EFFICIENT VEHICLES IN THE 1990S SUCH AS VANS, TRUCKS, AND SPORT UTILITY VEHICLES PUT AN END TO THIS TREND.

New Vehicle Miles per Gallon and Washington State Actual Vehicle Miles per Gallon (1970-2001)



Sources: EIA, ORNL, WSDOT

Sources: Energy Information Administration's State Energy Data System; Federal Highway Administration; Washington State Dept. of Transportation; Oak Ridge National Laboratories Center for Transportation Analysis

Transportation Trends - Sector Energy Intensity, Vehicle Miles per Gallon of Highway Fuel		
Units:	miles/gallons	miles/gallon
	WA Vehicle Miles Traveled divided by Fuel Use	National New Passenger Vehicle Fuel Efficiency
1970	12.9	
1971	12.9	
1972	13.1	
1973	12.8	
1974	12.5	
1975	12.6	
1976	12.6	16.9
1977	12.9	18.4
1978	13.2	19.2
1979	13.9	19.7
1980	14.4	22.2
1981	14.7	24.3
1982	15.2	24.9
1983	15.2	24.8
1984	15.3	24.7
1985	16.4	25.2
1986	15.6	25.8
1987	15.4	25.9
1988	16.4	26.1
1989	16.3	25.5
1990	17.1	25.3
1991	17.9	25.4
1992	18.7	25.1
1993	17.1	25.1
1994	16.7	24.9
1995	16.9	24.8
1996	16.2	25.0
1997	17.0	24.7
1998	17.3	24.5
1999	16.5	24.2
2000	16.8	24.5
2001	17.0	24.6

Like other sectors, Washington's transportation sector has become more energy efficient over the years. The average efficiency of Washington's vehicle fleet, based on total miles driven divided by fuel use, grew from 12.6 miles per gallon (MPG) in 1975 to 18.7 MPG in 1992. However, this improvement in vehicle fuel efficiency came to an end in the 1990s. Since 1992 Washington's vehicle fleet efficiency declined by 1.7 miles per gallon.

Gains in the efficiency of Washington's vehicle fleet through the 1980s were due to the replacement of old vehicles with more efficient models. However, new vehicle fuel efficiency has not improved since the mid-1980s, when Congress last increased Corporate Average Fuel Economy (CAFE) standards. CAFE standards require automakers to maintain the average fuel efficiency of new vehicles at 27.5 MPG for cars and 20.5 MPG for light trucks (which includes minivans, pickups, and sport-utility vehicles). CAFE has no mandates about how many vehicles may be sold in each category, and the increasing popularity of light trucks has caused the fuel efficiency of the average new vehicle to drop by almost two miles per gallon since 1988.

It is important to note that the actual on-road fuel efficiency of new vehicles is less than the EPA-rated fuel efficiency shown in the figure¹. As a result, the actual on-road efficiency of new cars and trucks is not better than the existing vehicle fleet. Thus vehicle stock turnover has not appreciably raised the efficiency of the vehicle fleet since the early 1990s.

Notes:

1. The Energy Information Administration estimates actual, on-road performance to be 25.5% worse than the EPA rating for cars and 18.7% worse for light trucks for models in 2000. (EIA, *National Energy Modeling System*, Fuel Economy Degradation Factor).

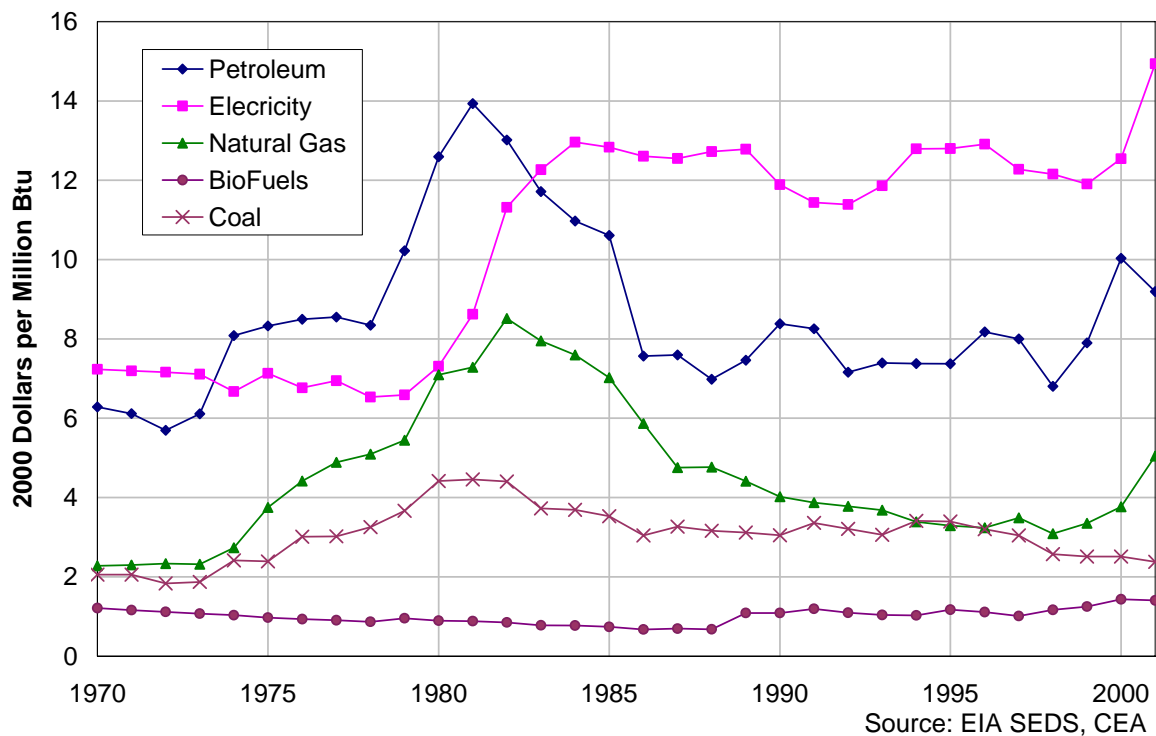
Links

No links to more current information

19. Washington's Average Energy Prices by Fuel

EVEN THOUGH ELECTRICITY PRICES IN WASHINGTON TEND TO BE LOWER THAN IN OTHER PARTS OF THE COUNTRY, ELECTRICITY IS STILL THE MOST EXPENSIVE ENERGY SOURCE. REAL ELECTRICITY PRICES¹ BEGAN RISING IN 2000 AFTER 15 YEARS OF RELATIVE STABILITY. REAL PETROLEUM AND NATURAL GAS PRICES DECLINED SIGNIFICANTLY FROM HIGHS IN THE EARLY 1980'S, BUT ALSO BEGAN RISING IN THE LATE 1990S.

Average Energy Prices by Fuel (1970-2001)



Sources: Energy Information Administration's State Energy Data System; President's Council of Economic Advisors

Average Energy Prices by Fuel					
Units:	2000 Dollars per million Btu				
Year	Petroleum	Electricity	Natural Gas	BioFuels	Coal
1970	6.28	7.23	2.28	1.21	2.05
1971	6.12	7.20	2.30	1.16	2.06
1972	5.69	7.16	2.33	1.11	1.83
1973	6.11	7.11	2.32	1.07	1.87
1974	8.08	6.67	2.73	1.04	2.42
1975	8.33	7.13	3.75	0.97	2.39
1976	8.50	6.76	4.41	0.93	3.01
1977	8.55	6.94	4.89	0.90	3.02

1978	8.34	6.53	5.09	0.86	3.26
1979	10.22	6.59	5.44	0.96	3.66
1980	12.60	7.31	7.09	0.89	4.42
1981	13.93	8.62	7.28	0.88	4.45
1982	13.02	11.32	8.52	0.85	4.40
1983	11.71	12.27	7.95	0.78	3.73
1984	10.97	12.96	7.59	0.77	3.69
1985	10.61	12.83	7.02	0.74	3.53
1986	7.57	12.60	5.87	0.67	3.04
1987	7.59	12.55	4.75	0.69	3.27
1988	6.98	12.72	4.77	0.68	3.16
1989	7.46	12.78	4.41	1.09	3.12
1990	8.38	11.89	4.02	1.09	3.05
1991	8.26	11.44	3.87	1.19	3.36
1992	7.16	11.39	3.78	1.10	3.21
1993	7.40	11.86	3.68	1.04	3.06
1994	7.38	12.79	3.39	1.03	3.41
1995	7.37	12.80	3.29	1.17	3.39
1996	8.18	12.91	3.24	1.11	3.20
1997	8.00	12.28	3.49	1.01	3.05
1998	6.81	12.16	3.09	1.17	2.57
1999	7.90	11.91	3.35	1.25	2.51
2000	10.03	12.55	3.77	1.43	2.51
2001	9.19	14.94	5.05	1.41	2.38

While the effect of the oil shocks of the 1970s on Washington energy prices was dramatic, it was relatively short-lived. Real petroleum prices more than doubled from 1972 to 1981 and then returned to values close to pre-1973 levels by 1986. Real natural gas prices followed a similar trend, rising steeply during the 1970s, falling during the 1980s, and staying relatively stable in the 1990s. The average price of electricity, which had been low and stable for years, almost doubled between 1978 and 1984 as the costs of new nuclear power plants, some of which were never completed, were incorporated into electric utility rates. In contrast to oil and natural gas prices, real electricity prices did not decline from the level they reached during the early 1980s. Prices for electricity, petroleum, and natural gas began rising in 1999 or 2000 and recent events suggest these trends may continue.

Average price trends for coal are similar to the other fossil fuels with prices in 2001 about half the peak in 1981, although prices have been trending downward since 1995. Biofuel prices have been slowly rising since 1988, but this fuel is still much less expensive than the other sources.

Notes:

1. Fuel prices are shown in real dollars. The actual (or nominal) prices in each year have been adjusted to constant dollars reflecting the value of a dollar in the year 2000. This is done by multiplying the nominal prices by a gross domestic purchases index for the U.S. for each year (where the value in 2000 equals 1). This adjusts for the effects of inflation and allows prices for different years to be compared.

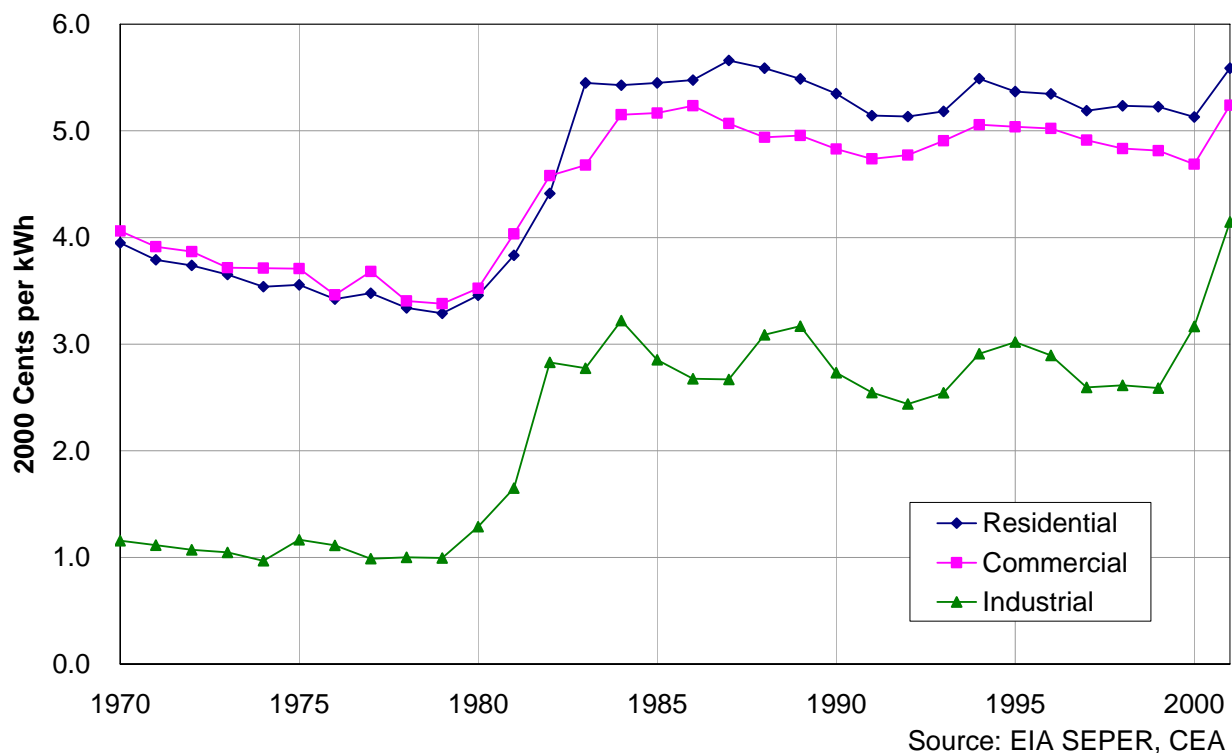
Links: See the Energy Data page on the Washington Energy Policy website for more recent electricity, natural gas and petroleum data.

http://www.cted.wa.gov/portal/alias_CTED/lang_en/tabID_532/DesktopDefault.aspx

20. Washington's Average Electricity Prices by Sector

REAL ELECTRICITY PRICES¹ INCREASED DRAMATICALLY BETWEEN 1979 AND 1984, THEN STAYED RELATIVELY CONSTANT THROUGH 1999 BEFORE RISING AGAIN IN 2000 AND 2001. WHILE INDUSTRIAL ELECTRICITY PRICES ARE LOWER THAN THE RESIDENTIAL AND COMMERCIAL SECTORS, THE RELATIVE PRICE INCREASES AROUND 1980 AND 2000 WERE MUCH HIGHER FOR THE INDUSTRIAL SECTOR.

Electricity Prices by Sector (1970-2001)



Sources: Energy Information Administration's State Energy Price and Expenditure Report; President's Council of Economic Advisors

Electricity Prices by Sector			
Units:	2000 cents/kWh		
Year	Residential	Commercial	Industrial
1970	3.95	4.06	1.16
1971	3.79	3.91	1.11
1972	3.74	3.87	1.07
1973	3.65	3.72	1.05
1974	3.54	3.71	0.97
1975	3.56	3.71	1.16
1976	3.42	3.46	1.11

1977	3.48	3.68	0.99
1978	3.34	3.41	1.00
1979	3.29	3.38	1.00
1980	3.46	3.52	1.29
1981	3.83	4.03	1.65
1982	4.41	4.58	2.83
1983	5.45	4.68	2.78
1984	5.43	5.15	3.22
1985	5.45	5.17	2.85
1986	5.48	5.24	2.68
1987	5.66	5.07	2.67
1988	5.59	4.94	3.09
1989	5.49	4.96	3.17
1990	5.35	4.83	2.73
1991	5.14	4.74	2.55
1992	5.13	4.77	2.44
1993	5.18	4.91	2.55
1994	5.49	5.06	2.91
1995	5.37	5.04	3.02
1996	5.35	5.02	2.90
1997	5.19	4.91	2.60
1998	5.23	4.83	2.61
1999	5.23	4.82	2.59
2000	5.13	4.69	3.17
2001	5.59	5.24	4.15

The most notable phases in real electricity prices are the steady or declining prices in the 1970s, the rapid increase between 1979 and 1984, and the period since 1984 when prices stayed relatively constant (with some up and down variation). This period of stable prices appears to be ending, with electricity prices trending upward in 2001. Price increases in the early 1980s were due to the costs of the WPPSS nuclear power plants, while increases in 2001 reflect the impacts of the West Coast Electricity Crisis.

Electricity price trends for the residential and commercial sectors from 1970 to 2001 were nearly identical. Industrial sector prices have been more volatile than residential and commercial prices. Industrial electricity prices in 2001 were three and a half times greater than 1970, versus a 30-40% increase for the residential and commercial sectors². On a per unit basis, the average increase also varied: 1.6¢ per kWh for residential, 1.2¢ per kWh for commercial, and 3.0¢ per kWh for industrial.

Notes:

1. Electricity prices are shown in real dollars. The actual (or nominal) prices in each year have been adjusted to constant dollars reflecting the value of a dollar in the year 2000. This is done by multiplying the nominal prices by a gross domestic purchases index for the U.S. for each year (where the value in 2000 equals 1). This adjusts for the effects of inflation and allows prices for different years to be compared.

2. Industrial electricity prices include the aluminum industry and other Direct Service Industries (DSI) that have historically had access to relatively low cost electricity from the Bonneville Power Administration. As production in these electricity price sensitive industries (such as aluminum

smelters) varies, it can have an impact on average industrial electricity prices. For example, in 2001 when aluminum smelters curtailed their production, non-DSI industries paying higher electricity prices made up a larger share of industrial electricity consumption, contributing to the increase in average industrial electricity prices.

Links:

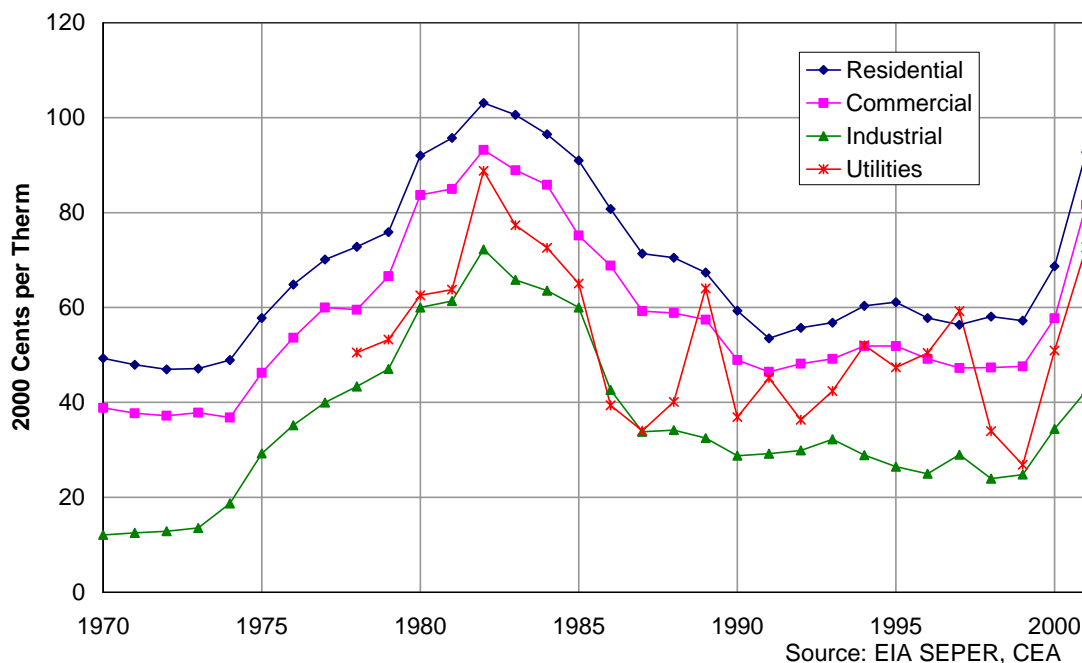
The Electric Sales and Revenue spreadsheet on the Washington Energy Policy website contains data on electric utilities in Washington State, including utility-level kWh sales, revenue, average prices, and number of customers from 1989 to 2002.

http://www.cted.wa.gov/CTED/documents/ID_1214_Publications.xls

21. Washington's Average Natural Gas Prices by Sector

REAL NATURAL GAS PRICES INCREASED RAPIDLY FOR ALL SECTORS BETWEEN 1974 AND 1982 AND DECLINED JUST AS RAPIDLY FROM 1982 TO 1991. AFTER REMAINING RELATIVELY STABLE DURING THE 1990S, NATURAL GAS PRICES BEGAN TO RISE IN 2000, REFLECTING SUPPLY CONSTRAINTS AND INCREASING DEMAND.

Natural Gas Prices by Sector (1970-2001)



Sources: Energy Information Administration's State Energy Price and Expenditure Report; President's Council of Economic Advisors

Average Natural Gas Prices by Sector				
Units:	2000 cents/therm			
Year	Residential	Commercial	Industrial	Electric Utilities
1970	49.32	38.85	12.08	
1971	47.94	37.71	12.50	
1972	46.95	37.17	12.82	
1973	47.11	37.83	13.50	
1974	48.94	36.80	18.71	
1975	57.79	46.23	29.24	
1976	64.82	53.64	35.20	
1977	70.12	60.01	39.95	
1978	72.79	59.55	43.36	50.50
1979	75.87	66.58	47.02	53.23
1980	92.02	83.72	59.98	62.56

1981	95.74	85.00	61.39	63.76
1982	103.08	93.20	72.24	88.79
1983	100.63	88.92	65.81	77.33
1984	96.49	85.83	63.55	72.57
1985	90.96	75.14	59.98	65.06
1986	80.75	68.81	42.62	39.39
1987	71.36	59.25	33.79	34.01
1988	70.50	58.84	34.17	40.10
1989	67.38	57.44	32.47	64.02
1990	59.33	48.93	28.76	36.90
1991	53.51	46.42	29.17	45.15
1992	55.74	48.16	29.87	36.34
1993	56.78	49.18	32.22	42.38
1994	60.33	51.86	28.89	52.02
1995	61.11	51.87	26.45	47.38
1996	57.78	49.19	24.94	50.42
1997	56.35	47.25	28.97	59.21
1998	58.09	47.35	23.94	33.92
1999	57.20	47.57	24.78	26.83
2000	68.68	57.74	34.40	50.91
2001	92.75	81.66	42.45	72.72

Real natural gas prices for the residential and commercial sectors were approximately two times greater in 2001 than in 1970 and industrial prices were three and a half times greater. During this period prices rose from 1974 and 1982, then declined between 1982 and 1991, and stayed relatively stable during the 1990s. Beginning in 2000 natural gas prices began to rise with residential and commercial prices approaching historic highs. This reflects supply constraints and growing demand, in part due to the increasing use of natural gas by the utility sector for electricity generation.

Average industrial natural gas prices have been significantly lower than the other sectors. Many large industrial customers began to make bulk purchases of commodity gas from suppliers other than their local utilities during the 1990s. The magnitude of price increases on a per unit basis for the industrial sector have been less than the other sectors, but were much larger in percentage terms because of lower industrial sector prices.

The utility sector has historically used natural gas to fire relatively small power plants used for “peaking”, which at least partially explains the price volatility experienced in that sector. Consumption has been relatively low with gas often being purchased on the spot market when needed. Growth in the number of gas-fired generators used for non-peaking purposes should result in increased utility sector consumption of natural gas and more stable prices.

Notes:

1. Natural gas prices are shown in real dollars. The actual (or nominal) prices in each year have been adjusted to constant dollars reflecting the value of a dollar in the year 2000. This is done by multiplying the nominal prices by a gross domestic purchases index for the U.S. for each year (where the value in 2000 equals 1). This adjusts for the effects of inflation and allows prices for different years to be compared.

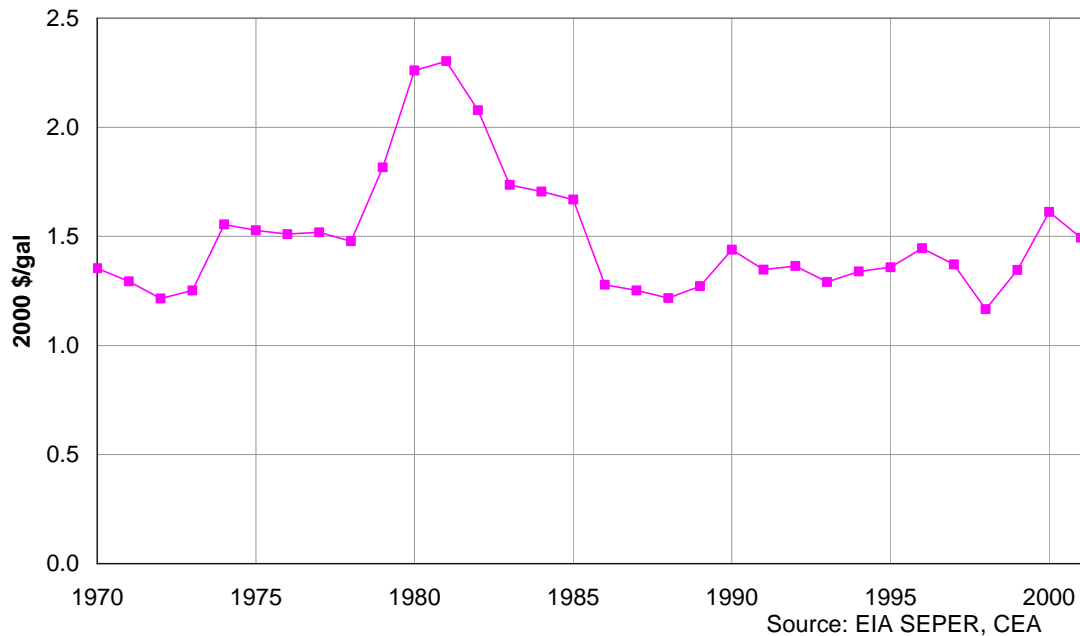
Links: The monthly natural gas data spreadsheet on the Washington Energy Policy website contains more recent monthly natural gas price and sales data by sector.

http://www.cted.wa.gov/CTED/documents/ID_1339_Publications.xls

22. Washington Gasoline Prices Since 1970

ADJUSTED FOR INFLATION ¹, GASOLINE PRICES IN WASHINGTON PEAKED IN 1981, THEN DECLINED TO AN HISTORIC LOW IN 1998, BEFORE RISING TO MID-1970S LEVELS BY 2001.

Washington State Gasoline Prices (1970-2001)



Sources: Energy Information Administration's State Energy Price and Expenditure Report; President's Council of Economic Advisors

Washington Gasoline Prices	
Units:	2000\$/gallon
	Motor Gasoline Prices
1970	1.35
1971	1.29
1972	1.21
1973	1.25
1974	1.55
1975	1.53
1976	1.51
1977	1.52
1978	1.48
1979	1.82
1980	2.26

1981	2.30
1982	2.08
1983	1.74
1984	1.71
1985	1.67
1986	1.28
1987	1.25
1988	1.22
1989	1.27
1990	1.44
1991	1.35
1992	1.36
1993	1.29
1994	1.34
1995	1.36
1996	1.45
1997	1.37
1998	1.17
1999	1.35
2000	1.61
2001	1.49

The dominant trend in gasoline prices in Washington from 1970 to 2001 has been relative stability with the exception of the period from 1979-1985 when prices spiked due to the world oil crisis. After peaking in 1981 at \$2.30 per gallon (2000 dollars), inflation-adjusted gasoline prices dropped to pre-oil crisis levels by 1986. In 1998, gasoline prices fell to their lowest level in this 30-year period, but rose again beginning in 1999, reflecting increasing world oil prices. In 2001, the price of a gallon of gasoline in Washington was slightly less than the inflation-adjusted price in 1974.

The majority of petroleum for Washington comes from Alaska and most of this petroleum is refined into gasoline in Washington, but the price we pay for gasoline is influenced by world oil prices. Gasoline prices in Washington tend to be a little bit higher than the national average.

Notes:

1. Fuel prices are shown in real dollars. The actual (or nominal) prices in each year have been adjusted to constant dollars reflecting the value of a dollar in the year 2000. This is done by multiplying the nominal prices by a gross domestic purchases index for the U.S. for each year (where the value in 2000 equals 1). This adjusts for the effects of inflation and allows prices for different years to be compared.

Links

For more information on gasoline prices, see the "Primer on Gasoline Prices in Washington State" on the Energy Policy website:

http://www.cted.wa.gov/CTED/documents/ID_1923_Publications.pdf.

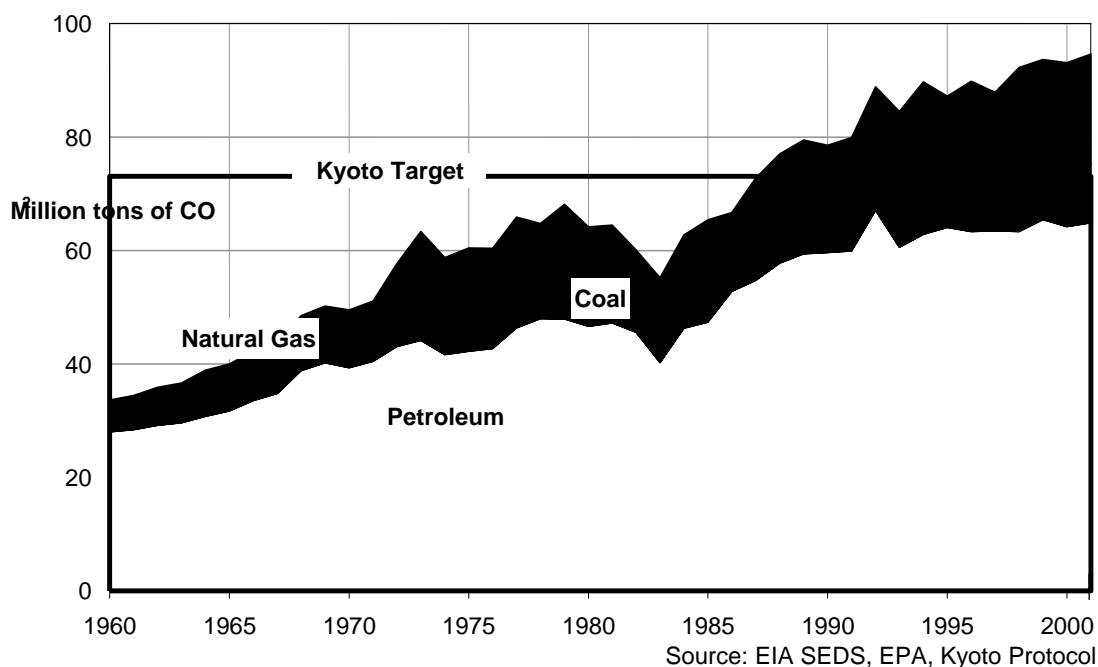
For current gasoline price information see AAA's Fuel gauge report:

<http://www.fuelgaugereport.com/>

23. Energy-Related Greenhouse Gas Emissions

WASHINGTON'S INCREASING RELIANCE ON FOSSIL FUELS HAS LED TO STEADY GROWTH IN EMISSIONS OF CARBON DIOXIDE, THE PRINCIPAL GREENHOUSE GAS. PETROLEUM USE, PRIMARILY FOR TRANSPORTATION, ACCOUNTED FOR 69% OF CO₂ EMISSIONS FROM ENERGY USE IN WASHINGTON IN 2001.

Carbon Dioxide Emissions from Energy Use by Source



Sources: Energy Information Administration's State Energy Data System, Kyoto Protocol

Carbon Dioxide Emissions from Energy Use by Source				
Units:	Million tons of CO ₂			
Year	Petroleum	Coal	Natural Gas	Total
1960	28.05	1.56	4.06	33.67
1961	28.44	1.61	4.39	34.45
1962	29.17	1.61	5.09	35.86
1963	29.63	1.35	5.64	36.62
1964	30.80	1.21	6.88	38.89
1965	31.72	1.24	7.01	39.98
1966	33.55	1.14	7.53	42.23
1967	34.78	0.85	8.16	43.80
1968	38.86	0.72	8.94	48.52
1969	40.21	0.72	9.26	50.20
1970	39.35	0.60	9.55	49.51
1971	40.47	0.66	9.98	51.10

1972	43.09	3.75	10.85	57.70
1973	44.16	6.67	12.55	63.38
1974	41.66	5.56	11.55	58.77
1975	42.26	7.82	10.34	60.42
1976	42.73	8.33	9.35	60.41
1977	46.36	10.50	9.00	65.86
1978	48.03	8.69	8.05	64.77
1979	47.95	10.16	10.02	68.12
1980	46.64	9.33	8.18	64.15
1981	47.23	9.32	7.92	64.47
1982	45.62	7.60	6.91	60.13
1983	40.24	8.23	6.75	55.22
1984	46.34	8.44	7.97	62.74
1985	47.36	9.61	8.45	65.42
1986	52.81	6.49	7.35	66.65
1987	54.73	9.82	8.21	72.76
1988	57.79	10.17	9.09	77.04
1989	59.44	9.92	10.14	79.49
1990	59.67	8.78	10.12	78.56
1991	59.95	9.14	10.83	79.92
1992	67.11	10.88	10.91	88.91
1993	60.59	10.03	13.86	84.48
1994	62.88	10.97	15.89	89.73
1995	64.08	7.16	15.96	87.21
1996	63.38	9.33	17.14	89.84
1997	63.47	8.26	16.19	87.91
1998	63.36	10.62	18.31	92.28
1999	65.48	9.94	18.24	93.67
2000	64.22	10.90	17.96	93.09
2001	64.93	10.21	19.50	94.64

Washington's continued dependence on fossil fuels for energy, particularly petroleum, has led to rapid growth in emissions of carbon dioxide (CO₂), the principal "greenhouse gas" contributing to global climate change. After dipping in the early 1980s, growth in carbon dioxide emissions accelerated after 1983 as the economy recovered from the recession and oil prices plummeted. Washington's CO₂ emissions from energy use grew more than 70% between 1983 and 2001.

Consumption of petroleum products, the vast majority for transportation, accounted for most of the growth in Washington's energy-related CO₂ emissions. Emissions from coal are almost entirely from one source, the Centralia Steam Plant which burns coal to produce electricity. Natural gas contains less carbon per unit of energy than other fossil fuels, but because of higher levels of consumption accounts for a larger share of Washington's CO₂ emissions than coal.

Also depicted is the emission target agreed to during the Kyoto negotiations in 1997, which is 7% below 1990 levels. Meeting this target would require a 23% reduction from Washington's 2001 emissions level.

Links: Washington State's Greenhouse Gas Emissions: Sources and Trends, June 2004
http://www.cted.wa.gov/CTED/documents/ID_1280_Publications.pdf